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Graduate Work on the Doctoral Level

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An article which may be of considerable interest to that ever-increasing number of industrial-arts and vocational-education instructors who are now working for higher degrees.

Since the late world war, numerous changes have taken place in all fields of graduate education. These changes have not been limited to any single type of higher institution. Teachers' colleges, publicly supported state institutions, and privately supported institutions have all been subjected to close scrutiny in every field of educational endeavor. These changes, originating largely from reports of experiments, investigations, and analyses, together with descriptions of current practice and authoritative discussions, have been many and far reaching in their effect. Around these, institutions have shaped policies and molded their curricular offerings.

The status of all graduate education in the United States is interestingly portrayed by a glimpse of the number of graduate students (since 1800) in relation to the continental area and the total population of the United States.

U. S. Census Years	Total Population in U. S. [2]	Graduate Students in U. S. [1]	Land Area in Sq. Miles in U. S. [2]	Per Cent of Population Students	Students per Sq. Mile
1800	5,308,483	411	876,980	.000077	.00046
1890	62,947,714	2,382	2,973,965	.000037	.00080
1900	75,994,575	5,831	2,974,159	.000076	.0019
1910	91,972,266	9,370	2,973,890	.00010	.0031
1920	105,710,620	15,612	2,973,776	.00014	.0052
1930	122,775,046	47,255	2,973,776	.00038	.015

Certainly profound changes have been made in industrial education on the graduate level, as in every phase of education. The aim of this article is to give a condensed summary of present practices, policies, and problems in graduate work, largely on the doctoral level. It follows an article which appeared in the January, 1936, issue of I. A. and V. E. under the title "Graduate Work." Material for the article was obtained through a study of graduate bulletins and catalogs, and from reading comparatively recent books, periodicals, and dissertations dealing in one way or another with tendencies of graduate schools offering the doctorate in the field of industrial education.

[1]Blose, David T., "Standards for the Master's Degree," Washington, D. C. American University. Unpublished Master's Thesis, 1933.
[2]Bureau of U. S. Census. Abstract of the fifteenth census of the United States, 1933.

One of the most notable tendencies in the field of industrial-arts and vocational-trade teaching is the steadily increasing number of men who have earned the doctor's degree. Ten years ago, the teacher of industrial education who possessed this degree was an exception, and a rarity. Today, college faculties, and some local systems, include many such men, and the number of men who are slowly but actively pursuing graduate courses to that end is truly impressive.

Significance and Responsibility Attached to the Doctorate

The degree of doctor of philosophy is purely a research degree. It is not in any sense a degree conferred solely as a result of study, no matter how faithful or diligent. It does not ordinarily rest merely upon any computation of time or enumeration of courses. Questions of residence and plans of study as are ordinarily listed in catalogs of graduate schools as "minimum requirements," are secondary. The granting of the degree is based essentially upon evidence of general proficiency and of distinctive attainments in industrial education, and particularly upon the recognized power of independent investigation. This is demonstrated by the production of a dissertation (thesis) embodying original, independent research or creative scholarship, presented with a fairly high degree of literary skill, which will add to the total sum of human knowledge, or which presents results that have a genuine enduring value in the field of industrial education. Some institutions expect far more of their doctoral candidates than do others.

The degree of doctor of education is also beginning to make its debut in the field of industrial education. This degree is solely a professional degree conferred in recognition of (1) a highly satisfactory command of the comprehensive body of technical knowledge peculiar to education; (2) proof of a candidate's ability to initiate, organize, and prosecute the investigation of significant problems in the field of education. The doctor of education differs from the degree of doctor of philosophy (1) as the practitioner's interest differs from that of the pure scientist; (2) in requiring professional experience; (3) and generally, in the omission of a reading knowledge of foreign languages as a requirement, except in those instances in which a candidate's dissertation makes it necessary, and (4) in some minor procedures leading to the awarding of the degree itself.

Organization and Administration

The work of a student looking toward the doctorate is ordinarily under the direction of the departmental faculty of the graduate school, or by a committee of the university faculty or graduate-school faculty, commonly known as the "graduate council," "academic council," "executive faculty," "administrative committee," or the "faculty committee" of the graduate school. The dean of the graduate school is the executive officer of this graduate body or council mentioned, and is ordinarily charged with general supervision of all graduate students and is usually the medium of communication between such students and the university administration.

The work of each student looking toward the doctorate is in charge of a special committee consisting of all or some of the teachers under whom his major and minor studies are pursued, a representative of his major subject being chairman. The student is always expected to confer freely with the members of his special committee, both in regard to the general plan of his work and in connection with individual courses of study. It is the policy of some graduate schools to designate one member of the department of the student's major as his "adviser" who acts in the same capacity as the student's special committee.

A graduate working toward the doctorate is expected to do work of a very superior quality, and as a general rule, no graduate

credit toward the doctorate is granted for work for which a student has earned lower than a "B" average. This is customary practice but there are also exceptions.

Resident Status

The graduate standing or resident status of a student seeking the doctorate is of considerable importance. In most graduate schools it is the basis of determining the length of time the student must attend the graduate school to satisfy minimum requirements for the advanced degree. Things taken into consideration in determining the resident status vary notably with the individual institutions.

Considerations which ordinarily determine full graduate or resident status are as follows:

1. The colleges previously attended by the student.
2. The quality of credentials submitted.
3. The number of courses in the graduate school registered for, attended, and satisfactorily completed.
4. Approval of the department in which the student proposes to continue his study.
5. The proposed major field for the advanced degree.
6. The fundamental work already completed, basic to the proposed major field for an advanced degree.
7. Whether or not the student desires actually to become a candidate for a higher degree.
8. Eligibility of the student to complete the requirements for a higher degree in consideration of minimum residence.
9. The amount of class teaching or other outside activities engaging the graduate student's time.
10. Payment of all fees necessary for each year of residence.
11. Residence for part-time instructors and assistants in relation to the amount of work being conducted by such students.
12. Number of points (credits or units) of work satisfactorily completed during each resident year.[8]

Graduate Instruction

In several scholarly dissertations, the fact is definitely shown that course offerings in most institutions profoundly reflect the training and experience of the various staff members where industrial education is taught. Policies regarding professional courses are influenced both by the preparation and background of the teaching staff and by the nature of the college in which the program is offered. To illustrate, programs in engineering colleges are likely to be taught by practically trained men who tend to emphasize technical training to the neglect of professional training. Students preparing for teaching service, therefore, should try to gain an understanding of the views taken by the staff members in the institution in which they wish to undertake work toward the doctorate. In our own definitely divided field of industrial education, it is found that some institutions have highly "flavored" courses of an industrial-arts nature, some of a vocational-industrial nature, and a few offer courses in both aspects of industrial education.

Fellowships and Scholarships

Fellowships and scholarships will be granted only upon formal application of the graduate student. This is made on a formal blank or form and filed with the dean, or sometimes with a committee on fellowships and scholarships. Such applications must ordinarily be filed not later than March, and in most cases formal application as early as possible is appreciated. Some institutions require that such applications be entered by February.

Applicants who have not been in residence at the graduate school to which they are applying for fellowship or scholarship, must have their applications accompanied by official transcripts of previous work, and letters of recommendation. Applications should also be accompanied by evidence of character, scholarship, ability, and general worthiness, as they are generally awarded as a mark of honor.

A distinction is ordinarily drawn between the fellowships and scholarships; the former, besides carrying a larger stipend, is assigned to students of more experience and more clearly proved ability and independence in graduate study and research.

Admission to Candidacy

Application for, and admission to candidacy for the doctorate, have similar requirements to those pertaining to the master's degree (reviewed in I. A. and V. E., 25:1–3). An application for admission to candidacy for the doctorate will ordinarily not be considered and approved by authorities until the applicant has:

1. Completed at least two full years of graduate work or its equivalent.
2. Passed examinations in foreign or modern languages where the same are required for the advanced degree.
3. Passed preliminary examinations in his major and minor fields of study.
4. Undergone such other tests of his qualification as his department may agree to apply.
5. Paid all necessary fees.
6. Filed his application for admission to candidacy.
7. Chosen and stated the exact subject of his dissertation.
8. Obtained the endorsement of his application from his major department.[8]

Ordinarily no candidate can present himself for final examination until his formal application for candidacy has been approved by the proper authorities.

Dissertation Requirements

In the field of industrial education, as in general education, a distinctive requirement is the presentation of specific evidence that the candidate has carried to successful completion an original investigation in his major interest. The theme of this investigation must be approved by the proper authority, which in turn is vested in various individuals according to institutional policies. Procedure and results of this investigation must be embodied in the dissertation itself. In most cases it is specifically stated that the production be an actual "contribution to knowledge." This is sometimes optional for the doctor of education degree. Dissertations are usually submitted in specific typewritten form by some date before that of the final examination.

The dissertation for the doctorate is usually required to give evidence of the candidate's power to carry on independent research and must be satisfactory in style and composition. The dissertation should normally be completed shortly before the candidate intends to go up for his degree, in order that ample time be afforded for thorough inspection by authorities. The number of final copies of both dissertations and abstracts of dissertations vary notably with institutions.

Final Examination

When the doctoral dissertation has been approved as giving evidence of high attainment and power of research, the candidate ordinarily proceeds to the final examination. A final oral examination is required in most institutions. While some require the final examination to be written, others reserve the right to require a final written examination in addition to the oral examination, when the same is deemed necessary. The final examination for the doctorate covers the candidate's dissertation in some institutions, and in others, it covers the more comprehensive aspects of major course content.

The doctorate examination is ordinarily given by a committee appointed by the graduate dean. The appointed members are usually professors from the candidate's major department. The final examination is ordinarily held shortly before commencement. The candidate will finally be admitted or recommended for the degree upon approval and vote of the examination committee.

[8] Herren, J. M., "Graduate Schools — Their Present Practices, Policies, and Problems," Cleveland: Western Reserve University, Unpublished Master's Thesis, 1931.

Minnesota's Contribution to Guidance

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In pointing out the contribution which the Michigan Employment Stabilization Research Institute has made to those working in or interested in the field of vocational guidance, the author is calling attention to a large body of factual material that was collected at the expense of much time and effort.

Of the many disasters which have befallen mankind, not a few have had beneficial results in that society was awakened to the folly of certain of its ways. Subsequent adjustment, elevating civilization to a higher level, has usually followed. The present depression with its far-reaching economic and social effects is not an exception. Its causes and effects are now sufficiently evident to warrant intelligent search for, and eventual remedy of, the practices which brought it about.

Among the foremost evidences of this distressing depression stands employment. Its tragic consequences make immediate action toward its ultimate removal imperative. That economic recovery and technological adjustment in industry will not entirely or permanently alleviate the condition is now recognized. Its causes are too firmly rooted in the inability of society to accurately predict employment conditions and trends, and to expertly guide the individual toward a happy and continuous employment consistent with his abilities, aptitudes and personality. Until this can be done intelligently the vexing problem of unemployment will be apparent in more or less disturbing proportions.

Some phases of the present urgent need are not of recent discovery. Brewer, a decade ago, in visioning the present crisis said,[1] "Research is needed, too, on the process of collecting studies of specific occupations. Mere job analysis may be a prime requisite for vocational education but it is quite inadequate for vocational guidance." Later, in 1929, the National Vocational Guidance Association recognized the scope and purpose of guidance in a modern age by tentatively adopting the following three principles:[2]

"These are three underlying principles which govern all vocational guidance activities.

"1. No two individuals resemble each other exactly in natural endowment or environmental conditions.

"2. Through social evolution occupations are becoming always more specialized. The nature of the task, its educational requirements, its demands on health, intelligence, special ability, temperament, and character, the opportunity it offers for training and advancement, the remuneration, the working conditions and the importance of the occupation and of the industry all must be accurately known.

"3. It is through this knowledge of the person and of the occupation that it is possible to assist the individual to make a choice at a given point of time. But the situation and personality of an individual are subject to change and occupational conditions are dynamic rather than static. Hence vocational guidance must take account of these changes and offer a continuous service to the individual at each step of his development."

Among important contributions to the knowledge necessary for ultimate realization of these principles must be included the wealth of valuable material emanating from the Minnesota Employment Stabilization Research Institute. Preceded in its organization by individual surveys of employment trends and fluctuations in St. Paul, Minneapolis, and Duluth from 1928 to 1930, the Institute was organized in 1930 to continue these three surveys as an associated effort on a wider and more intensive scale. The Institute was staffed with a trained personnel and its procedures were planned by a committee composed of experts in the fields of business, economics, psychology, education, sociology, and medicine.

The organization and scope of the Institute's activities centered in three major projects through which the problem of unemployment in north central United States was quite generously considered. While the projects were arranged as distinct units, all three were co-ordinated in contributing to the realization of the following general objectives of the Institute:[3]

1. To attack the problem from the standpoint of the local community.
2. To obtain a moving picture of how the dynamic forces in the present-day economic order affect employment conditions in a given locality.
3. To ascertain whether selection operates to determine which individuals of the working population are destined, as the wheels of fortune turn, to join the ranks of the unemployed.
4. To investigate the physical and psychological characteristics, the educational qualifications and aptitudes of these individuals.
5. To perfect vocational guidance tests.
6. To develop retraining and placement techniques.

Project I in aiming to[4] (1) ascertain how industrial changes are effecting the volume and character of employment; (2) analyze the obtained data with a view to revealing the types of vocational training and guidance that are needed under modern industrial conditions, and (3) determine what changes may be made in business organization and management that would help to stabilize the conditions of employment, was in short a study of the economic aspects of unemployment. In proceeding with its task, four major surveys were conducted:[5] (1) the individual case histories of four thousand unemployed; (2) the industrial survey of five hundred firms to determine growth, unemployment ratios, etc.; (3) the job analysis survey to determine training and skill required for all operations in the jobs analyzed, and (4) the survey of business migrations to determine the causes of the rise and fall of industries.

As a study primarily in psychology and education, Project II was principally concerned with the individual diagnosis and retraining of the 4,000 unemployed persons whose cases were studied in Project I. Analysis of these case histories contributed to the following aims:[6] (1) to test various methods of diagnosing the vocational aptitudes of unemployed workers; (2) to provide a cross section of the basic re-education problems of the unemployed, and (3) to demonstrate methods of re-education and industrial rehabilitation of workers dislodged by industrial changes.

The case studies were made through a clinic where each individual was questioned and tested to determine the predominate and contributing causes of his unemployment and to classify each person with respect to his actual or potential industrial usefulness. The procedure involved[7] (1) interviews covering educational and vocational history, and (2) vocational testing and physical and medical examination.

[1] Brewer, John M., Address Graduate School of Education, Harvard University, October 16, 1925. Allen, F. J., *Principles and Problems in Vocational Guidance.* New York: McGraw-Hill, 1927, p. 40.

[2] "The Principles of Vocational Guidance," Bulletin, National Vocational Guidance Association, pp. 2, 3. Graduate School of Education, Harvard University, Cambridge, Mass., 1929.

[3] The Minnesota Unemployment Research Project. Bulletin, Employment Stabilization Research Institute. Vol. 1, p. 7. University of Minnesota, Nov. 1931.

[4] *Ibid.*, p. 11.

[5] *Ibid.*, p. 13.

[6] *Ibid.*, p. 15.

[7] *Ibid.*, p. 15.

Working on the theory that groups of vocations differ markedly in the abilities, aptitudes, and interests necessary for their satisfactory pursuit, and that these qualities in an individual can be measured with some degree of accuracy, an extensive testing program was instituted. The battery[8] included tests of educational status, educational ability, clerical aptitude, manual dexterity, mechanical aptitude, physical strength, vocational interests, trade skills, personality traits, and sensory acuity.

Project III operates as a laboratory or testing ground for the techniques developed in the first two projects. It functions in tax-supported employment offices established in each of the three cities covered by the Institute's investigations. Through the development of these public employment agencies the Project expects[9] (1) to establish a unified system of labor clearance; (2) to establish in the public offices adequate statistical indexes of occupational and industrial trends and conditions in each city as a background for effective vocational guidance and placement; (3) to introduce scientific techniques for the individual diagnosis of the aptitudes and special qualifications of all applicants for jobs, and (4) to provide adequate personnel and equipment in order to maintain effective contact with employers of labor and to administer scientific selection and placement procedures.

Eventually the work of the first two projects will be incorporated in and continued by this latter project. Consequently, in the future, Project III may be regarded as an authentic source for information pertaining to employment problems.

Guidance values to be derived from the Institute are readily discovered with careful study of its various bulletins. These values are not unrelated to each other or distantly applicable to the immediate guidance needs. Rather the guidance aspects of the Institute's findings may be definitely organized into usable, worth-while techniques and information which can be recognized and used in present-day guidance programs as soon as the final findings and conclusions are published.

The Immediate Value of the Work of the Institute

The urgent need of definite guidance methods and procedures for immediate use may court a general disregard for the less immediate but nonetheless apparent values emanating from the Institute. Reference is here pointed to the wealth of experience in guidance gained by the various members of the Institute's staff. Nearly all these individuals are connected with universities or colleges in an instructional capacity. Of a certainty the future students of these men will procure a wealth of guidance knowledge from the association.

Of no less value is the writing which will no doubt be done by these men in the future. Already work from their pens has appeared. Inspiration and information through these published accounts may well be anticipated by classes in the theory and practice of guidance and by those who are actually engaged in that field.

Another contribution to the field of guidance results from the fact that the Institute's existence has caused an added consciousness of the need for guidance and its direct values. No organization of its size could actively function without drawing public attention to at least a few of its aims, methods, and results.

Although Minnesota attacked the study of its unemployment it perfected for the scale, the organization it perfected for the purpose has functioned successfully. With no guiding precedent to mark its path, the Institute was obliged to develop most of its methods and techniques as its work progressed. Subsequent endeavors of the same character by other states or cities should profitably consider the procedures and organization perfected by the Institute. In the same way guidance organizations may well look to the Minnesota enterprise for enlightenment.

But these are general contributions of little immediate value to the educator who desires to institute a worth-while guidance program in his own school. His need is for information directly contributing to the realization of the three principles of guidance activities referred to in the introductory portion of this article.

The first of these principles recognizes that all individuals differ and that each must be carefully studied and understood before efficient guidance can occur. Project II was concerned with this principle. Through case study and testing of 4,000 unemployed men and 1,000 employed workers certain general facts concerning group physical and mental characteristics were drawn. The relation of physical defects to age and past occupation was found. Educational, social, and economic history was investigated. These bits of information when combined with other facts taken from the studies in Projects I and III furnish a wide base of information for guidance use in schools. The procedures and techniques used in the tests and interviews are also of value in adequately studying the child. The testing program in itself offers much of interest to the guidance director or counselor.

Volumes I and II of the Institute's bulletin publications fail to state any very definite conclusions on the results obtained in Project I. The writer assumes that the work will be continued and that general conclusions will be made at a later date when the personnel of the institute can draw conclusions with adequate substantiation.

Project I, in studying 500 businesses and industries and combining this information with job analysis and individual case histories, offers much enlightenment on the second principle of vocational-guidance activities. Such information concerning the worker as age and sex, disabilities found among workers, age limits, special requirements, tools owned by workers, training required, mobility of the worker, length of service, and calculations required of workers, gives the guidance director a fund of pertinent material to present to the school child. Other information from Project I on the requirements of certain employment as kind of strength required, types of dexterity required, position of work, transportation within plant, machine setups, working conditions, ability to read blueprints, location of job, sanitation, lighting, safety precautions, pay, and hours, are of equal value in assisting the student in making an intelligent choice.

The public employment offices which were established in the three cities under survey will likely contribute consistently to the third principle of vocational-guidance activities. The function of these offices is almost identical with this last principle. Volumes I and II of the Institute bulletins offer little information on the results of the offices' activities. However, when the three projects of the Institute are combined and operated under the same organization as Project III, a fund of information should be forthcoming.

The type of this information is suggested by the following list of projected publications:[10] Employment Trends in St. Paul, Minneapolis, and Duluth; Analysis of the Duluth Casual Labor Group; Business Migration; A Business Index for the Northwest; Occupational and Industrial Trends 1900–1930; Preliminary Statement on the Job Analysis Study; Area and Character of Market and Competition in the Northwest; Significant Changes in Costs and Profits 1926–1930; Effects of Technological Changes on Skill, and others.

Summary

Although the work of the Minnesota Employment Stabilization Research Institute is not yet completed, its work as a contributing agent to the field of guidance is already evident. In spite of a noticeable lack of conclusive statements in the first two volumes of its bulletin

[8] "A Manual of Selected Occupational Tests for Use in Public Employment Offices," Bulletin, Employment Stabilization Research Institute, Vol. 2. July, 1933, pp. 61–74.

[9] "The Minnesota Unemployment Research Project," Bulletin, Employment Stabilization Research Institute, Vol. 1, p. 7. University of Minnesota, Nov., 1931.

[10] *Ibid.*, p. 26.

reports, the writer believes the Institute may be fairly credited with the following contributions to guidance.

A. Contributions to guidance in general
   1. The Institute's staff who will pass the benefit of its experience on to others through
      a) Classroom lectures
      b) Guidance literature
   2. An increased interest in guidance
      a) Needs
      b) Methods
      c) Values
   3. A model of organization for future endeavors of like purpose and size

B. Contributions to the three principles of guidance activities
   1. Principle I
      a) Procedures and techniques of testing for guidance purposes
      b) Methods of making case studies
      c) Conclusions which will eventually be drawn from the data derived from 5,000 case studies
   2. Principle II
      a) Procedures and techniques in the study of business and industry for guidance purposes
      b) Information concerning the requirements of workers in various vocations
      c) Information concerning the working conditions, advantages and disadvantages of various occupations
   3. Principle III
      a) Eventual information on that important but often neglected phase of guidance — follow-up activities
      b) Eventual information concerning organization and operation of employment offices which will likely be applicable to the placement phase of guidance work
      c) Eventual information concerning methods of using statistical information in advising worker and employer.

Present Trends in Vocational Education

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An account of how California is adapting vocational education to present needs.

Vocational education was started many years ago and had its greatest development during the world war under the leadership of Charles Allen and other able leaders.

Following the war, classes were introduced in many high schools offering a wide variety of trades courses. When the depression came, with no work for men and less chance for placing boys and girls in jobs, vocational education, with the exception of agriculture, had a decided letdown.

After several years of depression, we are entering on an era of prosperity, and again the need for vocational education is realized by various industries. This is evident from the fact that the workmen found in industry are now much older than was customary in past years. Skilled laborers are scarce. Most of the unemployed are unskilled workers. In San Diego, Calif., where a survey of workmen was made, it was found that the average age of carpenters is 55 years of age. This is due to the fact that for several years no apprentices have been trained in this trade. Industries are again taking orders for goods, but in California when work is started, it is found that skilled workers cannot be obtained in the numbers that are needed. As a result, certain associations are sending representatives out into other states to get workmen to fill these jobs. The industries are also meeting this demand in other ways such as putting on apprentices, training people in their own plants, insisting on the schools training the workmen, and depending on the workers to get their training and education by the trial-and-error method.

There are four agencies that are working on the education of the young worker. These are the schools, industries, National Youth Administration, and the Emergency Education Program. Each of these is working with a different group of workers, but in many cases their work overlaps.

The types of vocational training being offered by these agencies are: All-day trade preparatory, terminal trade preparatory, trade extension, training by industries, trade-union courses, and general educational courses. These various types will now be discussed, but the discussion will be confined to the vocational education now being offered in California.

The public schools are the slowest of the groups to push vocational education. This is due, no doubt, to the fact that the students are not yet so concerned as to their future as the older groups. Then too, the teachers are not so close to industry as are some of the other agencies. In a majority of public-school systems, nothing is done except prevocational work. The present trend in our junior colleges on the Pacific coast is toward terminal courses. San Diego is developing one of the best examples of this type of training, and it may well serve as a pattern for other schools. There are two distinct terminal courses in operation in the junior college, which in this city is in connection with the San Diego State Teachers College. This is only a matter of economy in the setup and has no connection with the plan used. The two courses developed to date are airplane mechanics and office training. The students applying for this type of training must first pass an examination. Then, those qualified are admitted with the understanding that very little college credit can be earned by this work, as it is definite training to fit the student for a job. The work is divided into two parts: First, shop experience and training are given at one of the commercial shops at the airport. Here the students put in their time building, repairing, and rebuilding planes, getting experience and instruction in all branches of the trade. In addition, they take mechanical drawing, sheet-metal drawing, navigation, strength of materials, and study of metals. The shop at which the practical work is given, also runs a training school for its own employees, and the time is allotted so that the junior-college boys' work in the shop while their own students are in class. The work done on the planes by the students, is inspected by a government inspector. What is being done here in airplane work may also be done in any other industry, and in any community, large or small, where industrial work is a factor. Special vocational instructors are provided for each branch of the work.

The second part of the students' training is taken at the San Diego State College. This work consists of English, mathematics, hygiene, and physical education. These subjects are not taught by the regular college instructors but by junior-college teachers who have been selected because they have had special training and experience in some trade which gives them the vocational point of view. These teachers are certified under Smith-Hughes or general secondary credential by the state. The latter requires a minimum of M.S. degree with the trade experience. The instructors at the field are vocational men. The students finishing this two-year course are ready to enter the airplane factories without going through any other preliminary training. When and as they see the need for further training, they are encouraged to take up the work offered under the adult-education programs.

In the secretarial or office-training course, much the same procedure is followed as for the airplane mechanics, with the exception that the secretarial students get all their

training and experience at the college. Actual experience is provided in the office of the school. This consists of taking dictation, filing, typing, and answering the telephone. The related classwork given to these students is to provide them with a background of culture that is needed to live in a changing world. It has been found that these students do better in the business world than the average student having a business-college training. The tuition is very small, as the junior college is a part of the public school. Some say this "exploiting" the student in schoolwork is not desirable, but in reality it takes their time and labor for return of instruction and experience. The classes in shorthand, typing, and other subjects are given regularly in connection with cultural subjects.

The public schools are also offering vocational work in the continuation school. These schools are for the student who is working on some job but is under the compulsory school age. In this type of school, trade-preparatory courses are usually offered. In a few cases, the student will be taking work that is related to his job as, for example, telegraph boys may take electricity and code work, thus preparing them for occupational advancement, or a maid may take maid's training which will enable her to do her job better, since the requirements of correct service have been studied.

A third form of vocational work that the public schools are offering is adult education. It is not for the young worker so much as for the person on the job and, in many instances, for older persons who are taking up new vocations, or for those who desire further knowledge in the subjects that they could not or did not get when in school. It is at this point that the training of the public school, the Federal Government, and industries, overlaps. In many instances they are co-operating.

Almost every high school has an evening-school or adult-education department. In many places, these classes are taught by the day-school teachers. For some work, of course, special teachers are employed. In this way, the teacher best fitted for the particular job can be obtained. For example, a class in airplane sheet metal must be taught by a teacher who has had experience in that particular trade as the airplane sheet metal handles quite differently from that ordinarily used in sheet metalwork. The day-school metalwork teacher may not be and usually is not familiar with the shop processes carried on in these plants.

The most popular type of training in adult education from the vocational standpoint is the trade extension classes. The particular subjects will depend on the location and the industries located in the community. A few of the most popular in southern California are: Airplane sheet metal, blueprint reading, machine shop, orange packing, radio, auto mechanics, typing, shorthand, mathematics, and Diesel-engine work. The students enrolled in these classes are all working at a trade. In many instances, they are all working in the same factory or for the same company. This makes it easier, as they all have a common interest and common problems as well as an understanding of what each needs and is doing.

Adult education is so necessary now because machinery has replaced much handwork, many industries have ceased to exist, new industries have taken the places of the old, and new methods are continually being introduced. Even workmen remaining on the job must make adjustments, and in some cases learn entirely new methods. Many industries are adding new machinery or making new products. This necessitates new methods. In some instances the new machines eliminate workmen. A very good example of this is the lima-bean industry. Formerly, beans were sorted by hand. A great many women picked out the pods and broken beans, as the beans passed by on a belt. With the perfection of the electric eye, much of this work is now done by machinery. This is also true in many other industries. Plaster-of-paris patterns are taking the place of wood patterns, thus introducing a new trade, or part of a trade.

The Federal Government, seeing the need for education for both the youth and the adult of the land, included an educational program in the Works Progress Administration setup. This program not only gives work to the unemployed teacher, but an opportunity to the people. The Youth program provides work for children of families on relief, so as to enable them to attend high school and even college. This does not specifically prescribe vocational education, but many of the counselors advise these students to take definite vocational courses. In most cases, the school sponsors the project, and provides work for these students making them assistants to the librarians, janitors, gardeners, and athletic coaches.

The Educational Emergency Program is generally in connection with the public schools, but in some instances it is not. The best example of where this program is not connected with the schools is at the CCC Camps. In this case, it is under army supervision and the teachers at the camps are under the supervision of the local district WPA offices.

This program makes it possible to give education to a larger number of people than can be reached by the public schools. It also provides education for leisure time in the form of play, music, drama, household arts, and similar subjects. This is raising the general level of learning among the people. Many students reached in this way, take reading, writing, and other elementary subjects, and one of the most important courses offered is citizenship which will develop more loyalty and an understanding of our government, especially by foreigners or those with parents not naturalized.

In the field of vocational education under the WPA the work in many instances is under the direction of the director of adult education for the public schools. The work usually has trade preparation in view. It is a definite attempt to readjust the people to new conditions. In many instances they are trained for a new job and find employment in industry, thus taking their names from relief lists. This will do more to get the country to attain normal conditions than anything so far tried or attempted. The fact will remain that training must continue. Some of the leading vocational subjects being offered in the courses here are: Blueprint reading, machine shop, maid's training, sewing, cooking, homemaking, woodshop, toymaking, auto mechanics, Diesel engines, and any other subjects in which a sufficient number are interested.

Industry, as already stated, is doing a great deal of vocational training. In California, where much skilled labor is in demand, it is necessary for the industries to train their own help. The chain grocery stores, for instance, require their employees to attend on company time and take courses in salesmanship, how to meet the public, knowledge of the products, store management, and the like. The oil companies require their employees to go through a training school studying their products, salesmanship, how to service a car, courtesy to customers, business management, and the like. This is generally done on the employee's own time or on a reduced salary before he starts work in a filling station. The trade unions maintain schools for their apprentices and the airplane plants usually train their helpers on the job. This is done by giving a helper to certain workmen who are supposed to teach certain operations to these learners. As soon as the learner becomes proficient, he may be classified as a workman and given more pay. Most of this training is of the trade-preparatory type, but under actual working conditions.

These recent trends in vocational education, as developed in our schools and by industry, are adaptable, with few changes, to any community needs. It is, of course, always necessary to make changes and adjustments in vocational classes from year to year as needs and students change.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

Sir Charles William Siemens

Earnest students of industrial arts and vocational education find the biographies of the leaders in science and industry not only interesting, but educational and inspirational. This is especially true if the lives studied pertain to men who discovered, invented, or improved processes, tools, machines, or materials which are in common use today. If, as Beaconsfield says, "A great man is one who affects his generation," then Charles William Siemens may well be called a great man, and that is the reason why his biography has been chosen for this month.

Karl Wilhelm Siemens was born at Lenthe in Hanover, Germany, April 4, 1823. He was the fourth son in a family of 14 children. His father was a farmer who cultivated land rented from the German government. Karl Wilhelm received his early education at Lübeck, and in 1838 he entered the Polytechnical School at Magdeburg, where he studied the principles of natural science. His brother Werner, who was lieutenant of artillery in the German army, was stationed here, and under his tuition, William studied mathematics in the early morning hours before the opening of school. In 1839, William's mother died, and a few months later, in January, 1840, his father followed her in death. After this, Werner, then only 23 years of age, assumed the position of head of the family. In 1841, William left Magdeburg to enter the university at Göttingen. It was while in attendance at this school, at the age of 19, that he joined his brother Werner in perfecting the electroplating process which had been introduced but a short while before. He went to London with the intention of patenting the idea. In his quest for someone to undertake the work of securing the patent for him, he met a Mr. Poole, who provided him with a letter of introduction to a man named Elkington at Birmingham who was engaged in the electroplating business. He succeeded in demonstrating the superiority of the process worked out by his brother and himself, and received for it the not inconsiderable sum of 1,490 pounds. With this, he returned to Germany.

In 1843, he entered the engine works of Count Stolberg to acquire the practical knowledge which he thought a mechanical engineer ought to possess. Again, working in connection with his brother Werner, a chronometric governor for steam engines was invented which was quite an improvement over Watt's centrifugal governor then in use. Because England's patent law protected the inventor, Germany having no such laws at that time, William again went to England to take out a patent, and thereafter chose England as his home, although he did not become a naturalized British subject until 1859. In 1845, Werner and he perfected an anastatic printing process, and they also made some improvements in the calico printing methods used at that time. In 1846, he invented a compound air compressor which was quite favorably received. It was in this year, too, that he began a serious study of fuel economy. To test out his idea on heat conservation, he designed and built a 4 horsepower regenerative steam engine using superheated steam. This engine gave promise of great things, and the manufacturing firm Fox, Henderson, and Co., of Smethwick, employed him at a fixed salary of 400 pounds per year to perfect it. The steam engine, however, despite its ingenious character, could not be simplified to the point where it could become a commercial success. Hence, at the close of 1852, the relations between the firm and Siemens were severed.

A water meter invented by Siemens in 1851, however, was widely adopted and became quite successful commercially. In March, 1852, Siemens went to London to establish himself as a civil engineer. On his brother Werner's suggestion, he now began to study the application of the regenerative idea to the furnaces commonly used in industry. The first trials were made on furnaces in which steel and iron were reheated. It was found that while the saving of fuel was even greater than had been expected, there still were difficulties to be overcome. In doing this, a gas producer was devised which extracted the gas from the coal before it was used in the furnace. This improved the action of the regenerative furnace still more and its use was extended and widely adopted by the glass-making industry.

The Siemens brothers next applied their furnace to the process of steelmaking, first by melting pig iron and scrap steel or wrought iron together, afterwards by producing the steel directly from the iron ore. Steel made by this method is known as open-hearth steel.

The question of telegraphic submarine cables also proved to be of interest to both Werner and William Siemens, and they not only were instrumental in producing a number of inventions and improvements in telegraphic apparatus, but the firm of Siemens and Halske also acted as consulting engineers in the construction and laying of the cables. William Siemens also opened a factory in London where telegraphic materials were produced.

This remarkable man is especially to be admired for his untiring energy, his tenacity of purpose when once started on a project, and for the thoroughness with which he combined theory and practice. He was a rare combination of the scientist, inventor, and business man. Space will not permit us to enumerate all of the inventions and improvements which are credited to this man in the fields of mechanics, heat, and electricity. His accomplishments in any one of these would suffice to make him great.

His home life was ideal. He had married Miss Anne Gordon, a sister of Lewis Gordon, Professor of Engineering at the University of Glasgow, on July 23, 1859. On his extensive travels he would usually be accompanied by his wife. By 1878, he had amassed quite a bit of money which made it possible for him to mingle more freely with the literary and scientific personages of his time. Many medals and honors were conferred on him by the various scientific societies in England and in other countries. He was elected to membership in the Institute of Civil Engineers, the Royal Society, the Institute of Mechanical Engineers, the Iron and Steel Institute, the Cambridge Philosophical Society, the Society of Telegraphic Engineers, the Society of Arts, and the Chemical Society. He also held office in many of these organizations and was active in all of them. Honorary degrees were conferred upon him by the universities of Oxford, Glasgow, Dublin, and Würzburg. In April, 1883, Queen Victoria conferred upon him the honor of knighthood.

Early in November, 1883, he was suddenly seized with an illness, and on the 19th of the month, he peacefully passed away in his 61st year. He had accomplished many outstanding things in a comparatively short life, which, if carefully studied by the young men of today, might give wholesome direction to many lives which now, because of lack of incentive, are drab and commonplace.

Co-operative Vocational Training

L. Clifford Herness

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An abstract of a master's thesis by the author entitled "The Extent and Nature of Co-operative Part-Time Vocational Training in Public High Schools of the United States" written under the supervision of Professor W. R. Lueck, at the University of North Dakota, Grand Forks.

Someone has aptly said, "The contributing power of men to human well-being is limited to vocational efficiency." The main purpose of public education is good citizenship. The atttainment of this objective requires more than knowledge of history, government, appreciation of literature or art, and ability to hold our own socially. Citizenship also requires the ability to render service to society and to ourselves.

Vocational efficiency is most easily attained by intelligent vocational training combining the two factors of theory and practice. A plan embodying these principles has been utilized in certain public high schools of the United States. It is the purpose of this report to present the background of the co-operative part-time vocational-training plan, together with its extent and nature.

According to the United States Department of Interior,[1] an investigation made in 1924 revealed that out of 69,000,000 persons 21 years of age or over, 18.86 per cent had completed some of the work in high school; 6.22 per cent were high-school graduates; 4.55 per cent had completed some college work and 2.14 per cent were college graduates. From the foregoing figures one is able to see that 25.08 per cent or one fourth of the total population twenty-one years or over depend entirely on the secondary schools for their vocational preparation.

In selecting the co-operative part-time vocational-training plan for this study, it was the writer's assumption that this form of training has been adopted by public high schools in many parts of the United States. Since co-operative part-time vocational training as an integral part of the regular public high schools has considerable merit and promise, there is a need for a compilation of data on this form of training as applied to public high schools. The public high schools in the smaller communities and rural sections have a distinct problem of their own as compared to the larger metropolitan areas. In the smaller communities the young people do not have the ready access to specialized vocational schools. Accordingly, the public high schools in these smaller communities have as a consequence, a huge problem in giving the vocational training that is needed by its young people.

Because of the complexity of industry with its numerous highly specialized activities, the cost of adequately equipping the public high schools for vocational training would almost be prohibitive in these smaller communities. Besides, there is the maintenance and the replacement of obsolete equipment to be considered. In these communities it would also be necessary for the instructor of vocational training to be master of several trades, as it would be impossible to have separate instructors for each trade. It is difficult also, to secure instructors competent in more than one trade. The most then, that public high schools, especially in the smaller communities, can hope to do is to offer vocational training only in the most commonly pursued vocations and then only on a generalized basis. For the average high school the co-operative part-time plan may be an answer to these vocational-training problems.

The Co-operative Plan

The co-operative part-time plan for vocational training was inaugurated at Cincinnati, Ohio, in 1906. It was originated by Dean Schneider of the University of Cincinnati, in connection with the engineering college. After a few years of trial in college work it was instituted in classes of high-school grade with practical results. In 1928 the Federal Board for Vocational Education,[2] reported 78 cities in 21 states, using the co-operative part-time plan in schools of the secondary level.

In a co-operative part-time course the pupil alternates between work on the job, and instruction in school with time given to each divided equally. A common arrangement used by the public high schools is to have the pupils spend half day in school and half day on the job. The pupils usually attend school in the forenoon and work on the job during the afternoon. Some schools employ the arrangement whereby two weeks are spent in school followed by two weeks at the training job. Under both the half-day-about and two-week-about plan the pupils are often arranged in pairs so that while the one is in school the other is on the job. Pupils are paired in this manner whenever it is necessary to facilitate a continuous progress in the instructional program of the classes in school, or on the job.

The pupils receive high-school credit for this training on the job. The general arrangement is to allow one credit for each two hours per day spent in the place of training.

A program of this type is under the supervision of a school representative known as the co-ordinator. He usually visits the pupils on the job once each week.

Along with regular high-school subjects designed to provide a broad economic, social, and civic development there is provision under this plan for courses which deal with the theories and related sciences of the occupation, and the work on the job, so as to offer an opportunity for practical application and understanding.

In order to locate the public high schools in the various states which offer co-operative part-time vocational training, a preliminary question blank was sent to heads of state departments of education, preferably those in charge of the division of industrial and vocational education, and to men in the colleges having a wide acquaintance in the field of vocational training. The returns from these question blanks reported 63 public high schools offering this type of training. A second questionnaire asking for detailed information to the plan, selection of places for training, methods of selecting the pupils, and the success of this type of vocational training was then sent to these 63 public high schools. Forty-three out of the 63 or 68.2 per cent returned the questionnaire answered.

Present Status of the Plan

The investigation shows that there are 28 public high schools with the plan in operation. It was found that the plan is more prevalent in the Middle West than in other sections of the United States. It was also found that 62.9 per cent of the schools having the plan are in cities below ten thousand in population. Of the total public schools in communities with a population above ten thousand, 45 per cent have discontinued the plan. The depression

[1] United States Department of Interior, *Biennial Survey of Education in United States*, Bulletin Number 16, Volume 1, p. 431.

[2] Federal Board for Vocational Education, *Co-operative Part-Time Education*, Bulletin No. 130, p. 8.

was given as the reason in 55.5 per cent of the cases where the plan had been discontinued. Montana was found to have the largest total enrollment for all the states. During the years of 1930 to 1934 inclusive, a total of 826 pupils were reported to have been in co-operative classes.

Eighty-two per cent of the total reported that they keep accurate record of attendance. Twenty-three or 82 per cent provide for general class discussions in school which is related to the training on the job. Thirteen or 45.5 per cent of the co-ordinators visit the pupils once on the job each week. Twenty-one or 75 per cent report that pupils are changed to different occupations if found to be not suitable to the originally chosen occupation. Sixty per cent reported that employers are co-operative and that they do not attempt to exploit the pupils. Reports indicated that 53.5 per cent of the schools require examinations upon completion of courses. Eighteen or 64 per cent of the schools operating under this plan use outlined courses. The questionnaire reports indicate that the procedure for outlining the courses was based first on listing the various types of work done on the job and then these were grouped together in a way which will permit proper allotment of time to each job in the place of training. All the schools reported that the co-ordinator locates pupils in suitable places for training; adjusts difficulties between employer and pupil, and counsels the pupils concerning special problems they may have. Twenty-two or 78.5 per cent of the co-ordinators reported that pupils' past experience in part-time and summer employment are factors which are considered when selecting pupils for vocational training.

Twenty-four or 85.7 per cent of co-ordinators report that they select the places where training is to be carried on. Reports show that the type of equipment, success of the firm, efficient work conditions, safety and health provisions and opportunities for instruction are the factors most frequently considered by co-ordinators in selecting places for training.

Under the co-operative plan, classes for 83 different occupations were reported to have been organized. The largest enrollment was found to be in auto mechanics, office work, machinists' trades, retail saleswork, and patternmaking.

The study revealed that the schools provide related subjects for 29 different occupations. Related subjects for retail saleswork have the highest reported frequency while related subjects for auto mechanics rank second. Subjects related to machine-shop work ranked third.

Organization

It was found that every plan investigated is supervised by a representative of the school known as the co-ordinator. Four schools reported having a full-time co-ordinator in charge of the program. In all the other schools reporting, it was found that the co-ordinator devotes only part of his time to the administration of the plan. Reports show that 39.5 per cent of the co-ordinators have industrial-arts teaching duties; 21.4 per cent have academic teaching duties while 28.5 per cent have administrative duties. The average time devoted to the plan by co-ordinators is 3.07 hours per school day. The variation in time devoted was from one fourth of an hour to full time. Reports show that co-ordinators have an average of 35 pupils under their supervision. From this it is possible to see that, on the average, co-ordinators supervise between eleven and twelve pupils for each hour per day devoted to the plan.

Co-ordinators having degrees represent 75 per cent of the total. Forty-two per cent have majored in industrial arts, while 25 per cent have majored in education. Fifty per cent have practical experience as tradesmen in specific fields.

It was found that 53.5 per cent of the schools provide for occupation-information courses. Thirteen or 43.5 per cent reported that courses are given during ninth year.

Eleven or 39.1 per cent reported that they provide for exploratory courses in school in the form of industrial-arts work.

Values of the Plan

It was reported by 32.1 per cent of the schools that the pupils failing in academic subjects, succeed in vocational training, while an equal percentage reported that only some of them succeed. The study revealed that 6.4 per cent of all pupils enrolled under the plan are academic failures.

Nineteen or 68.5 per cent of the schools reported that pupils are found to improve in their academic subjects when enrolled under this plan.

It was reported by 78.5 per cent of the schools that the specific aim of the plan is development of skill whenever essential to the occupation. A few schools also reported that the training on the job serves as a means of confirming the pupils' choice and maintain that it is also the aim of the plan to provide for opportunities to explore.

Reports from 53.7 per cent of the schools indicate that 61.7 per cent of the pupils are placed upon graduation. Eighteen or 64.3 per cent of the schools reported that 66 per cent of the pupils continued permanently on the job where they were trained. Eleven or 39.3 per cent of the schools reported that 65.8 per cent of the pupils continued in the vocation for which they were trained under the plan.

Twenty-four or 71.4 per cent of the schools with this form of training reported that its outlook for the future is good.

Twenty or 71.4 per cent of the schools reported that the interests attitudes of the pupils toward the plan are very satisfactory.

Twenty-one or 75 per cent of the co-ordinators in charge of the plan reported that the attitude of the community toward the plan is very favorable. Only one reported that the attitude of the community has not been favorable toward the plan.

The Boy, the Project, and the Teacher

Edward H. Crussell
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The contents of this article may be trite, but it contains good sense and deserves to be followed faithfully.

The Boy

A safe method of determining whether or not a certain educational procedure is correct is to ask, "How does it affect the pupil and his chances of securing what he is sent to school to obtain?"

That seems to be simple enough, yet people who have devoted years to the study of this particular problem have been known to arrive at totally different conclusions. The difficulty seems to be, while all are agreed that the pupil's best interests must be the only consideration, they cannot agree upon what these interests are, or even upon the question of what he is sent to school for. This being so, all that anyone — superintendent, principal, supervisor, or classroom teacher — can do is what he thinks best according to the light that is given him, being careful to have some telling points for his side of the argument should it ever be assailed.

Take the case of Bill Willits. Bill is twelve years old, in the low seventh grade and just entering the woodshop for the first time. If things go as planned, Bill will get half a year of woodshop, half a year of mechanical drawing, half a year of electricity, and half a year of metal. This will bring him to the ninth grade where he can elect his shop subject, provided, of course, there is any room left in the class he chooses.

Right now Bill is in the woodshop, and a number of different people have positive ideas about what he ought to do there, and what he is in the woodshop for. Bill's father thinks one thing, Bill's mother another. Bill's grown-up sister wants a cedar chest. Bill's brother went through the woodshop a year ago. Bill's neighbors on either side and Bill's chum in another grade, all know what Bill ought to do. Bill himself has some decided ideas on the subject and wants to know at once, if he can make anything he wants. Bill's woodwork teacher looks at Bill and the twenty-five or thirty other young Americans who make up the low seventh class and gets ready for work — real work.

Not that the teacher is dismayed. Bill is all right, bright, clean, intelligent; so are the others. Typical million-dollar American kids. The sort of youngsters anyone would be proud to own; but for all that, of all the people who have ideas of what Bill ought to do in woodshop, Bill's own ideas are the least reliable.

This is so evident that it is difficult to prove. Like trying to prove that the sun shines or that water is wet. "A boy's will is the wind's will," and Bill is a boy. For the greater part of his twelve years, he has had just about his own way in everything. He has been able to devote practically all his energies to this end, and practice has made him something of an expert. Before he reaches man's estate he'll have to learn that life doesn't consist in having your own way at all times, that a great part of it, in fact, is made up of doing things you don't want to do, and doing them because they are the right things to do. The school shop is a fine place in which to teach Bill that if we can't get what we like, the next best thing is to like what we can get.

With these things in mind, Bill's woodwork teacher also has ideas of what Bill ought to attempt in woodshop and the projects he ought to make there. He has his own measuring stick for grading these projects. Here it is:

The Project

1. It must teach something useful.
2. It must be within the pupil's ability.
3. It must be economical of material.
4. It must contain pupil interest, evident or hidden.
5. It ought to be useful.
6. It should conform to accepted ideas of good design.

These items are set down in the order of their importance and if the reader thinks there are too many of them, he can start cutting at the bottom and work upward.

The project must teach something useful. Or what is different and more important, the pupil must learn something useful through the making of it. If it fails in this, it fails utterly, because that is all that schools are for. It is what woodwork and other school shops are equipped for, though this fact is often lost sight of by the very people who ought to keep it most constantly in mind. The project is unimportant, but what the pupil learns while making it is very important, and the best projects teach things of more consequence than a mere knowledge of the use of tools, or the correct assembling of properly tooled material into a finished article. Self-reliance, industry, perseverance, to mention only three.

The project must be within the pupil's ability. That is, within his present ability plus that which he will acquire while working on the project. This also is important. Much dissatisfaction and heartache has been caused by permitting Bill to start something there was no possible chance of his ever being able to finish. It goes without saying that the finished project must be Bill's work alone. Bill is a straight-thinking citizen and he'll get no real thrill from a piece of work, the most difficult part of which was done by the teacher.

On the other hand, the project must not be too easy. It should tax Bill's powers to the utmost because, unless we try to do a little more than we possibly can, we'll never do all that we possibly can.

The project must be economical of material. This, at the present day and date, is becoming more important than ever. Years ago it was no uncommon thing for a pupil to pay five to ten dollars for the material in a project. Today, and in the same school, two dollars is harder to produce. Even in prosperous and easy-money times, this requirement still holds. Each dollar's worth of material should provide its equivalent of teaching content, otherwise the project is a poor one. There must be proper relation between the cost of the article and the number of useful things the pupil learns while making it.

Another thing that must be watched is the cost of the finished article as compared with the price of the same thing in the stores. By means of special machinery, manufacturing plants can use up scrap material and turn out small woodwork articles at prices which are below what the school department has to pay for the bare material. Much unfavorable and unnecessary criticism may be caused by charging a dollar for the material in a folding ironing board when a similar ironing board may be seen advertised at seventy-five cents.

The project must contain pupil interest. That is, the pupil must be interested in making it, or it must be possible to make him interested. Pupil interest is a strange thing. Left to himself he doesn't usually show interest in anything for more than short periods at a time. On the other hand, if the project contains the first three requirements, it should be easy for a real teacher to create, or stimulate, the pupil's interest in it. Good teaching is nothing more than the creation of interest and it is no more difficult for the real teacher to create and maintain interest in the making of a mortise-and-tenon joint, or of a footstool, than it is in the making of a birdhouse, a bobsled, or a toy airplane. Read the second chapter of Mark Twain's *Tom Sawyer;* none of Tom's workmen had any original interest in whitewashing fences.

Years ago, the writer was a beginning teacher in a grade school. The classes were supposed to follow a definite course and there was a list of projects for the different grades from the sixth to the eighth. The list did little good, for when set to work on the first project for any grade, each pupil would declare he had already made it. Inquiry of the former teacher of that center elicited the information that the pupils were probably telling the truth, that they had been permitted to go on from one grade to another, and that some of the sixth-grade pupils had probably gone half way through the low-eighth-grade list of projects. To avoid argument, the writer threw away the list and began to devise entirely new projects of his own. Things went pretty well after this until about the second week when a pupil who had overstayed his vacation returned to school. He showed a disposition to move around and visit, but was given material and told very definitely to get to work.

"What is this I am to make?" he wanted to know.

"It's a necktie rack. Get busy with it."

He went off, muttering to himself, so the teacher called him back. "What was that you said?"

"I said I had six necktie racks now, and only one necktie."

"And a very good answer, too. Next time you have anything like that to say, say it to me, don't go away mumbling about it. You are absolutely right, you have necktie racks enough." He was then given another project, what it was has

been forgotten. All this is merely to lead up to the sequel. The next time the class was in the shop, the teacher, making his rounds, found this pupil working not on the new model, but on the despised necktie rack.

"What is the idea of this?" he queried. "I thought you already had six necktie racks?"

"Oh, well, I kinder like this one."

"Oh, well, you can't have everything you like, it isn't good for you. You put the necktie rack away until you have finished the other job and in future don't commence any new models until you have consulted me and received permission."

The project ought to be useful. Meaning that it should not be made to be thrown away. No one, man or boy, can do a really good piece of work if he knows beforehand that it is going to be thrown into the furnace when finished. Of course, this term *useful* can be made to cover quite a field and if the project contains the first four requirements, we wouldn't bother too much about its lack of usefulness.

The project should conform to accepted ideas of good design. The trouble here is to decide what are the accepted ideas. A teacher ought to have some ideas of his own on this matter and some reasons for these ideas. The chances are that if the design looks good to him, it will look good to a number of other people. The requirement is only of consequence in a large and costly project and for these there are designs enough and to spare.

Something should be said about how the project is to be taught. This is most important for it often decides the matter of interest. This is why some teachers will praise a certain project while others declare it to be useless. Merely a difference in the handling and presentation. The work should be done and the project made in the way that the pupil will receive the most benefit. It doesn't have to be done by the commercial method. Any tool processes the pupil uses should, however, be according to the methods of best craftsmanship. The pupil may later take up woodworking as his vocation. The way he went at the making of the different parts of a footstool in school will not be of much consequence. The habits he formed in using saw, plane, and chisel, if good ones, will be a big help to him; if bad ones, a serious drawback and hard to correct.

Mention of the footstool reminds me of something else. We often hear adverse criticism of old-style manual-training projects. Much of this is deserved but because a thing is old, or has been made before, is no reason for discarding it. Apply the measuring stick and if it meets all six requirements, or even the first four, then it is a good project no matter if it was old when Noah built the ark.

Well, there is the end of the project and its requirements, we could easily have made a longer list of what a project should not be.

The Teacher

Our space is already filled but we can say all that we want to say about the teacher with a verse from an old scrapbook:

"Mark Hopkins sat on one end of a log,
A farm boy sat on the other.
Mark Hopkins came as a pedagogue
But he taught like an elder brother.
And I don't care what Mark Hopkins taught,
If his Latin was small and his Greek was naught
For the farmer's boy he said, said he,
All through lecture time and quiz.
'The kind of a man I'm going to be
Is the kind of a man Mark Hopkins is.'"

Glossary of Printers' Terms—II

R. Randolph Karch

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This is a continuation of the list which appeared in the last issue of this magazine.

Open Matter. Type lines very widely spaced.
Optical Center. The center of a rectangle as it appears to the eye; about two fifths from the top of the rectangle.
Optimus Press. A style of two-revolution cylinder press.
Orotype. A machine for producing proof of type on cellophane, principally for offset and gravure use.
Outline Halftone. A halftone plate in which the background is cut away.
Overlay. In press makeready, a piece of paper placed in the tympan to make part of the form print heavier in that place.
Overrunning. Setting type backward or forward in making corrections.
Over-Wire Binding. A type of single-sheet binding for booklets.
Package Label. A gummed slip of paper for sticking addresses on packages.
Pad. A number of sheets of paper stuck together by gluing one side of the pile.
Pamphlet. Several sheets of paper stitched together.
Panel. A square or rectangular design made up of rule or border.
Paper Drill. Device used for drilling holes in stacks of paper.
Parallex Coil Wire Binding. A device for binding single-sheet booklets.
Pearl. An old size of type, now 5 point.
Pebbling. A process of graining, crimping, etc., paper to relieve the eye of shiny effects.
Peerless Press. An old style of platen press.
Pen. A style of type face.
Perfecting. Printing on both sides of the paper.
Perforating Machine. A machine used to perforate small holes in a row to facilitate tearing.
Phenix. A style of type face.
Photocomposing. Process for lettering in lithographic work.
Photoengraving. The process of making printing plates by the action of light on a film.
Photogravure. The process of printing from an intaglio engraving.
Pi. Mixed type.
Pica. The standard unit of measurement for printing material. Twelve-point type.
Pigment. Substance used for coloring in printing ink.
Pin Mark. The mark made by a pin that ejects a type from the mold in casting.
Planer. A smooth block used to knock type to its feet.
Plate. A duplicate of type forms. A piece of engraved metal used in printing illustrations.
Plate Cylinder. The cylinder on a rotary press holding the printing form.
Platen. The flat part of a platen press facing the bed, on which the tympan is placed.
Platen Press. A style of press that makes impressions from a flat surface.
Point. A mark of punctuation; also, the unit of measurement.
Point-Set. Letters of a type font which are cast to point multiples.
Point System. The measurement of all printing material is made on the point system.
Positive. Corresponding with the original in making printing plates.
Potter Press. A style of offset press; also a make-of-proof press.
Premier Press. A style of two-revolution cylinder press.
Press. A machine for making printed impressions.
Press Feeders. Those who hand feed a printing press; also applied to automatic feeding devices placed on printing presses.
Pressman. One who makes ready on presses.
Press Proofs. Proofs made on the regular printing presses.
Primary Colors. Yellow, red, and blue.
Printing Ink. A pasty substance used to print from types and plates on paper.

Printing Engineer. Efficiency expert to the printing trade.
Printer's Marks. Emblems or trade-marks of printers.
Process Engraving. See thermography; also engraving.
Process Printing. Printing from color plates with process inks and plates.
Progressive Proofs. Proofs of color plates used as a guide to the pressman.
Proof. The first print of a printing form, read to detect possible errors.
Proof Planer. A felt-bottomed block used to take proofs by hand.
Proof Press. A machine for making prints of forms and plates.
Proofreader. One who reads proofs and marks errors for correction.
Proofreader's Marks. Signs used by proofreaders to denote errors.
Proof Roller. A small hand-inking roller; a brayer.
Proportion. Comparative relationship between the elements of a piece of printing.
Pull a Proof. To make a print for proofreading.
Pulp. The mass of material used to make sheets of paper.
Punch. The original die used in typefounding.
Punching Machine. A contrivance used to punch holes in paper.

Quads. Blank types used to space out at the ends of lines in type composition.
Quoin Key. A tool used to manipulate quoins.
Quoins. Small wedges used in locking up type forms for the press.
Quotation Furniture. Small sizes of metal furniture.

Rack. A framework used to hold type storage cases.
Railroad Furniture. Metal furniture similar to the shape of railroad rails.
Raised Printing. See thermography.
Ready Print. Inside sections of newspapers bought printed with feature articles, comics, etc.
Ream. Five hundred sheets of paper constitute a "printer's ream."
Register. The adjustment of pages so that they will print in the correct position over another printed form.
Reglet. Wooden pieces similar to 6- and 12-point slugs.
Relief Printing. Letterpress printing.
Reverse Plate. A printing plate in which the black and white has been reversed.
Revise. A second proof taken to check on errors.
Rollers. Printing rollers.
Roll-Leaf Stamping. A process of stamping gold leaf on covers of books and like work.
Roman Numerals. The Roman system of notation, in which the following symbols are used: I=1; V=5; X=10; L=50; C = 100; D = 500; M = 1,000.
Roman Type. The regular style of type used in book and newspaper composition.
Rotaprint. A small offset press.
Rotogravure. The process of making intaglio impressions on a rotary press.
Roughing. See pebbling.
Router. A device used to cut away surplus metal from printing plates.
Rubricator. One who ornamented initial letters and other parts of ancient manuscripts and printed books.
Rule. Strips of brass or lead used to print straight lines.
Rule Cutter. A device for cutting rule to size.
Ruling Machine. A machine used to penrule lines on papers, as on billheads and statements.
Running Head. The title of a book printed at the head of each page.
Running Title. See running head.
Run In. Proofreaders mark the proof "run in" when they do not wish the matter to be paragraphed.
Run Out. To make a hanging indention.

Saddle Stitch. To fasten a pamphlet by stitching it through the middle fold of the sheets.
Safety Paper. Paper treated so as to make alterations impossible. It is usually done by printing in a design in light tint.
S. and C. Sized and calendered paper; smooth-finished paper.
S. and S. C. Sized and supercalendered, a glossy paper.
Sans-Serif. American gothic type faces; type having no serifs.
Saw Trimmer. A machine designed to cut linotype slugs and other material to point size.
Scale. A list of wages or prices.
Scare Head. A very large newspaper heading.
Score. To crease paper to facilitate folding.
Scotch Roman. A style of type face.
Screw Chase. A chase used in newspaper offices with screws on the top and one side to tighten the form.
Scribe. One who copied books by hand before the invention of printing.
Script Type. A style of type similar to handwriting.
Seconds. Inferior material.
Section. A signature, or group of signatures.
Serif. The short cross line at the ends of the main strokes of some styles of type faces.
Setting a Stick. Adjusting a composing stick to measure.
Shadow. A style of type face.
Sheetwise. Pages imposed in two forms.
Short And. The mark &; ampersand.
Shoulder. The part of a type not covered by the face.
Show Card. A large advertising placard.
Side Head. A heading set to the side of the main composition.
Side Stitch. The fastening of pamphlet sheets together sideways.
Signal. A style of type face.
Signature. A section of a book; the letter or figure appearing at the bottom of the first page of a signature to guide the binder.
Signature Mark. A guide to the binder printed in the gutter of a signature.
Signature Press. A machine used to press together signatures in a bindery to make the books flat. See smashing.
Size. A sticky yellowish ink used in bronzing.
Skeleton. The border and blank space of a printing form before placing in the type matter.
Skeleton Chase. A large iron frame, with dovetail slots in which crossbars fit.
Sketch. A style of type face.
Slitter. A device used to cut or slit paper as it passes through a press.
Slim Black. A kind of type face.
Slug. A thick lead, 6 points and upward; a line cast on a typesetting machine.
Slug-Casting Machines. See linotype, ludlow.
Small Caps. Capital letters of smaller size than the usual capital letters provided with a font of type.
Smashing. Pressing signatures together so that they will lay flat.
Solid Matter. Type composition not leaded.
Sorts. The types in a box in a type case.
Spiral. Device for single sheet binding.
Space. Metal blank used in spacing between words in type composition.
Spectrophotometer. Device for color measurement.
Square Four. Four pages imposed so that when printed on both sides, and cut, two sections of four pages each are made.
Spray Gun. Device for eliminating offset by spraying certain liquid on printed sheets.
Standing Matter. Type composition held over for another printing.
Stamping Press. A machine used in embossing.
Static. Electricity in paper causing sheets to stick together.
Steam Table. Equipment used in drying matrices in stereotyping.
Static Bar. Device for eliminating static on presses.
Steel Engraving. See copperplate engraving.
Stereotype. A printing plate cast from a paper matrix.
Stipple. A printing surface on printing plates that consists of fine dots.
Stock. Paper.
Stone Man. A workman who locks up forms and imposes pages in a printing plant.
Stop Cylinder Press. A cylinder press in which the cylinder stops between impressions.
Straight Matter. Plain composition.
Stream Feeder. A type of sheet feeders for cylinder presses.
Sub. An abbreviation for substitute, used in printshop chapels.
Stymie. Style of type face.
Subhead. A secondary title or heading.
Supercalendered. Extra smooth paper stock.
Superior Figures or Letters. Small letters or figures cast on the extreme upper part of the body for reference purposes; thus: $^{1\ 2\ 3}$, $^{a\ b\ c}$.
Sweating On. A process of fastening a printing plate on a metal base.
Symmetry. The arrangement of elements over a given axis, so that a division through that axis will divide it into halves.

Tablets. Sheets of paper glued together at one end.
Tabular Matter. Lists of matter in columns, usually separated by blank space or lines.
Tack. Stickiness, as in printing ink.

Text. Straight or body matter of a book.
Text Type. Usually black letter patterned after the old script of hand-written books.
Thermography. The process of dusting freshly printed sheets with powder, so that when heated the powder fuses, forming a raised surface of the print.
Thick Space. The 3-em space.
Throw-Off Lever. A device for keeping a platen press from making an impression while the press is running.
Tint. A very light color.
Tint Block. A block for printing a very light color.
Tissue. A very thin paper used in make-ready.
Transpose. To change a word or letter from one place to another.
Triple Case. A type storage drawer for holding three fonts of type.
Tweezers. Small nippers used in handling small sizes of type.
Twentieth Century. A kind of type face.
Two-Line Letter. An initial letter covering two lines of the text matter.
Two-Revolution Press. A cylinder press that makes two revolutions of the cylinder in printing one sheet of paper.
Two-Thirder. An advanced apprentice who has served two thirds of his apprenticeship.
Tying Up. The process of wrapping type forms with cord to keep them from being pied.
Tympan. The paper that covers the platen or cylinder on a press.
Typary Composing Machine. A photographic composing machine used in lithographic printing.
Type. Printers' letters, made of metal, having a character cast in relief on one end.
Typefounding. The making of types.
Type High. The standard height of type, .918 of an inch.
Typotabular System. An assortment of small 6-point squares, which may be divided by brass rule, used in setting tabular matter.
Typographer. A master printer.
Typography. The art of printing from movable types.
Typographical Union. An organization of compositors.

Underscore. To set a rule under a word or sentence in type composition.
Underlay. A piece of paper placed under a form in making ready.
Unit. A standard of measurement.
Universal Press. A style of platen press.

Vandercook Press. A style of proof press.
Vaporin. A high-speed, quick-drying printing ink.
Varnish. A substance used in making printing ink, the vehicle.
Vignette. Halftone plates in which the background gradually fades away.
Virkotype. A thermograph machine.
Vogue. A style of type face.

Washington Press. A style of hand press, now obsolete.
Watermark. A faint design or lettering pressed into paper while it is still in pulp form.
Wax Engraving. The process of making printing plates by engraving in wax, then electrotyping.
Wayzgoose. An old-time printers' festival.
Web Press. A printing machine in which the paper is fed from a roll.
Weight Font. Type bought by the weight, to fill a standard-size type case.
White Space. The part of a piece of printing not covered with type matter.
Wickersham Quoin. A one-piece locking device used in locking type in a chase.
Wire Stitcher. A machine for fastening books and pamphlets together.
Woodcut. A wood engraving; an illustration engraved on one form, then turning for a second printing on the other side.
Wove Paper. Paper having the appearance of a piece of cloth, having fine lines running each way of the sheet.
Wrong Font. A wrong face of type in a piece of composition.

Yankee Job Case. A style of type storage drawer.

Zinc Etching. A printing plate made by photography and the chemical processes of acid.
Zinc Halftone. A cheaper form of halftone made in a coarse screen on zinc.

Testing and Tests

A Comment on Tests

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Hints on making tests, together with samples of various types.

I. *Things to be Considered in Making Tests*[1]

1. Type of tests. Use as many different types as possible in a testing program, i.e., True-False, Completion, Multiple Choice, Matching Test, and the like.

2. Tests should be directed toward measuring the knowledge, skills, and attitudes which the teacher is trying to develop. They should measure what has been taught rather than set up a criteria for teaching.

II. *Constructing the New-Type Tests*[2]

1. The teacher should list as many plausible statements as he can think of to cover the work to be tested.

2. Go through the list of statements and throw out any that are not "always" right or "always" wrong. Be certain that a statement is not obviously right or vice versa, as, for instance, Henry Ford did not fight in the war of the revolution.

3. Next arrange the statements as near as possible in the order of their difficulty proceeding from the relatively easy to the more difficult ones. This will tend to distribute the students somewhat better, because the slow ones will at least do something, while the fast ones will do much more.

4. Divide the test into parts of as nearly equal difficulty as possible. In making this division, do not take all the odd questions and put them in one test, because, if the directions given in the previous paragraph, have been carried out, it is obvious that the even questions will be more difficult than the odd ones. To overcome this take the steps as shown below, alternate the easy question of each pair between the two tests:

	Test 1	*Test 2*
Questions	1	2
	4	3
	5	6
	8 and 9, etc.	7

5. Arrange the tests so that the answers will be one above the other down the side of the paper either in front of the questions or behind them in order to make the test easier to score.

6. It is also suggested that the plus sign (+) be used for the true statements and a (0) for the false ones to more clearly differentiate between the marks.

7. Studies show that tests which give instructions to students not to guess at the answers, are more reliable than the tests which neglect this advice. Nevertheless, all tests should be corrected for guessing, using any one of the following formulas: Right — Wrong = Score, or

[1] Symonds, P. M., *Measurement in Secondary Education*, Macmillan Co., 1929.
[2] Ruch, G. M., *The Objective or New-Type Examination*, Scott, Foresman & Co., 1929.

Attempted — 2 Wrong = Score, or this formula which is considered the most reliable Score = Right $-\frac{\text{Wrong}}{\text{No. 1}}$.

8. These tests, once correctly made, may be kept and used over a period of years, providing that each time before either form is given the instructor goes over the test and throws out any questions which have not been taught that year. It must be remembered that the test should not be used as a method of determining what should be taught.

9. The multiple-choice test should be arranged with numbers in front of the several choices. The pupil then is to place the number of the correct choice in the space provided before the question. To eliminate guessing at least four choices should be given when possible, but do not try to pad the choices with impossible statements or words.

10. The choices should not fall on the same number each time. They should be distributed according to chance so pupils will not get "test wise."

11. The completion type of test should be made according to the first four steps outlined on the construction of new-type tests. Then leave out significant words or phrases in each statement.

12. Be very careful not to leave out so many words or phrases in a sentence as to make the test too difficult.

13. Be careful not to indicate the number of words or phrases *wanted* by a definite number of dashes.

14. Place dashes before the statements or after them on which students may write their answers instead of writing them in the sentence. This makes scoring easy. See the following two samples of the same test.

15. The matching test may consist of several types: (1) The matching of words or phrases. (2) The matching of pictures with words or phrases. (3) Pictures matched with pictures. See sample tests.

16. In matching words or phrases, do not have the same number of items in each column, to obviate guessing.

A test should be so constructed that 90 per cent of the students can and will answer all the questions in the time allowed. Three to five items can be answered per minute by an ordinary group of pupils from these new-type tests.

Dr. Ruch claims that a question containing the words *always* or *never* is generally wrong. He also says that if a statement is neither true nor false, or only sometimes true, it should be put into the multiple-choice test, and not in the true-false type. In making completion tests, do not attempt to find out too much about the subject in one sentence.

Industrial-Arts Test No. 1

DIRECTIONS: This test contains a number of statements, some of which are right and some of which are wrong. In each instance, make a capital **R** in front of the statement which you think is right, and a capital **W** in front of the statement if you think it is wrong. *Do not guess.*

Example: **R** A jackknife is used for whittling wood.

1. .... When stock is being squared, the miter square should be used in testing for squareness.
2. .... The grain of the wood should be examined before planing.
3. .... When tools are being ground, oil should be put on the carborundum wheel.
4. .... The hole for a round-headed screw should be countersunk.
5. .... The coping saw is used to cut curves in thick stock.
6. .... Basswood is a hardwood.
7. .... When a flat surface is being sanded, the sandpaper should be used on a block of wood.
8. .... When the beauty of the grain of the wood is to be brought out, paint is used.
9. .... The setting of a marking gauge should be checked with a rule before the gauge is used.
10. .... When a hole is being bored through a board, bore part way through and then bore from the reverse side.
11. .... When starting to square a board, select the best surface as a working surface.
12. .... A screw driver should be sharpened to a chisel point.
13. .... The rule should be set on edge when it is used for measuring.
14. .... The backsaw is used for cutting curves.
15. .... The plane iron is sharpened like a chisel.
16. .... The teeth of a coping saw point the same way as the teeth of a backsaw do.
17. .... The crosscut saw is used to cut with the grain.
18. .... The twist drill is used to bore holes in iron.
19. .... The jack plane is shorter than the smooth plane.
20. .... The hacksaw is used to cut iron.
21. .... The block plane is used to cut all the way across the end grain.
22. .... A marking gauge is used to tell the depth of a hole.
23. .... A chisel is used to drive screws.
24. .... Poplar is a softwood.
25. .... A gouge is used to carve out the inside of a model boat.
26. .... Oak is the best kind of wood for the hull of a model boat.
27. .... A V block is used when cutting thin wood with a coping saw.
28. .... A try square is used to measure with.
29. .... A brace is used to hold the auger bit when boring holes.
30. .... The lever cap is part of a square.
31. .... A bit gauge is used to stop a bit from going too deeply.
32. .... A hammer is used to pound a chisel.
33. .... A marking gauge is used to draw lines.
34. .... The dividers are used to draw circles on wood.
35. .... The setscrew is a very essential part of the plane.
36. .... The jack plane is larger than the block plane.
37. .... The rule is used to draw lines.
38. .... In order to secure greater strength when using nails, the nails should be driven straight into the wood.
39. .... When holes are being bored to fasten two boards together, the hole for the threaded portion of the screw should be smaller than the hole for the part of the screw immediately beneath the head of the screw.

Name .....

Industrial-Arts Test No. 2

DIRECTIONS: This test contains a number of statements, some of which are right and some of which are wrong. In each instance, make a capital **R** in front of the statement which you think is right, and a capital **W** in front of the statement if you think it is wrong. *Do not guess.*

Example: **R** A plane is a useful tool to the home owner.

1. .... When tools are being whetted never use oil on the stone.
2. .... For finishing cuts, the cap iron should be set ¼ in. or more from the edge of the single plane iron.
3. .... When stock is being squared the sliding T bevel should be used in testing for squareness.
4. .... Oily rags and waste should always be placed in wooden containers.
5. .... While working at power machines, it is best for pupils to work in groups.
6. .... Oak is an open-grained wood.
7. .... The size of the teeth on a saw determines the difference between a ripsaw and a crosscut saw.
8. .... It is good practice to remove blocks of wood and other waste material from the floor around all power machinery.
9. .... Shellac sets more rapidly than does varnish.
10. .... When testing an edge hold the beam of the square against the working face.
11. .... Kiln drying is a faster method of drying wood than air drying.
12. .... Black walnut is a softwood.
13. .... When a large amount of stock is to be removed, a file is used.
14. .... The oftener glue is heated the stronger it becomes.
15. .... A sharp plane will leave a smoother surface than sandpaper.
16. .... Copper is of a reddish brown color.
17. .... Paint brushes are cleaned with soap and water.
18. .... Varnish is a colorless liquid.
19. .... The teeth of a ripsaw are filed straight across.
20. .... The natural color of shellac is orange.
21. .... The diameter of the screw below the head in a No. 10 screw is less than that of a No. 8 screw.

22. .... Use an auger bit for boring holes into iron.
23. .... A bench hook is used to chisel on when chiseling at the bench.
24. .... A rasp is used to smooth lead and tin.
25. .... The drawknife is used to whittle wood.
26. .... Paint is thicker than stain.
27. .... The ratchet brace is used when boring in corners.
28. .... The auger bit cannot be sharpened.
29. .... Everyone should be allowed to run the power machines.
30. .... A No. 5 auger bit will bore a hole ¼ in. in diameter.
31. .... No. 30 copper wire is larger in diameter than No. 26.
32. .... A No. 10 wood screw is larger in diameter than a No. 9.
33. .... The mortise chisel is used on lathe work.
34. .... Dowels are used to make joints.
35. .... The hand screw is used to screw two pieces of wood together.
36. .... The miter square can be used when making picture frames.
37. .... The center punch is used for driving nails below the surface of the wood.
38. .... Cypress wood should be used for outdoor work.
39. .... A chisel is sharpened on both sides.
40. .... Varnish dries much faster than does shellac.
41. .... Poplar wood is very easy to work.
42. .... Glued joints are much stronger than nailed or screwed joints.

Name .....

Industrial-Arts Test No. 3

Name .....

DIRECTIONS: This test consists of two columns with numbers in front of the left-hand column. You are to match the words or phrases in the two columns by placing the number of the phrase in the left column in front of its meaning in the right column. See example. *Do not guess.*

Example: 1. Hammer (1) driving a nail

I. This group pertains to tools you should know.
1. Nail set ( ) cutting metal
2. Auger bit ( ) putting screws flush
3. Ball-peen hammer ( ) cutting holes in metal
4. Solid punch ( ) cutting holes in wood
5. Screw-driver bit ( ) putting nails flush
6. Cold chisel ( ) making a brass ash tray

II. This group pertains to wood.
1. Hard ( ) Poplar
2. Soft ( ) Chestnut
3. Very hard ( ) Oak
4. Little or no grain ( ) Maple
5. A pronounced grain ( ) White pine

III. This group pertains to metal.
1. Silver colored ( ) Brass
2. Silver scaled ( ) Iron
3. Black ( ) Tin
4. Reddish brown color ( ) Galvanized iron
5. Yellow ( ) Copper

IV. This group pertains to planes.
1. Block plane ( ) Making picture frames
2. Rabbet plane ( ) Matching wood in floors
3. Smooth plane ( ) End grain planing
4. Tongue and groove plane ( ) Rough board planing
5. Jack plane ( ) Finish planing

V. This group pertains to saws.
1. Hacksaw ( ) Putting locks in doors
2. Backsaw ( ) Cutting curves
3. Coping saw ( ) Putting floor plugs in houses
4. Compass ( ) Cutting metal pipe
5. Keyhole saw ( ) Cutting across the grain

VI. This group pertains to abrasives (To wear away by rubbing).
1. File ( ) polishing steel axles
2. Sandpaper ( ) polishing table tops after varnishing
3. Rasp ( ) sharpening a scraper
4. Steel wool ( ) last process in preparing wood for staining
5. Emery Cloth ( ) roughly removing waste wood

VII. This group pertains to fastening.
1. Bolts ( ) used in holding two pieces after gluing them
2. Nails ( ) used in jointing wood edge to edge (table top)
3. Dowels ( ) used in jointing edges of boxwood
4. Corrugated fastener ( ) joining two pieces of metal
5. Hand screws ( ) used in joining and holding butt joints

Mechanical-Drawing Questionnaire

DIRECTIONS: Some of the following statements are true and some are false; you are to write a **T** after each statement which you think is true and an **F** after each statement which you think is false. *Do not guess.*

Example: Drawing is a useless thing to know. **F**

1. The successful student must develop the ability to concentrate. ....
2. A 3H drawing pencil is harder than a 5H drawing pencil. ....
3. In mechanical drawing accuracy is far more important than speed. ....
4. The appearance of a drawing affects its usefulness. ....
5. The T square must not be loose. ....
6. Mathematical ability is of little use in the making of drawings. ....
7. A good drawing board is made of hardwood. ....
8. The light should come from the right and front for right-handed students. ....
9. Poorly constructed drawing instruments are worthless. ....
10. Good thumb tacks may be easily removed with the thumb and finger. ....
11. Only the upper edge of the T square should be used for drawing. ....
12. The 45-deg. triangle has legs of equal length. ....
13. The student who wastes time gets the highest marks. ....
14. Improperly worded notes on mechanical drawings may convey an opposite meaning. ....
15. The pencil and ink legs of the compass should be equal in length to the needle leg. ....
16. Preliminary sketching and planning aids one in making nice drawings. ....
17. The scale should be used as a straightedge. ....
18. A chisel pointed pencil lasts longer than a conical pointed one for fine construction lines. ....
19. All good triangles are manufactured of transparent material. ....
20. A common medium pencil is better than a hard drawing pencil for preliminary sketches. ....
21. Drafting pens may be sharpened on an oilstone. ....
22. It is not important that the drafting student have clean hands. ....
23. The French curve is used for drawing smooth curves through plotted points. ....
24. Both sides of the drawing paper are the same. ....
25. The dividers are used for drawing circles. ....
26. All drafting work cannot be executed efficiently while the student remains comfortably seated. ....
27. The triangles should be used without the T square. ....
28. Both sides of the tracing paper are not the same. ....
29. The conventions for babbitt and white metal are the same. ....
30. The over-all dimension should be furthest from the drawing. ....
31. Less than 2 views or more than 3 views are never required. ....
32. Mechanical drawing is the language of industry. ....
33. The dimension line is more important than the extension line. ....
34. Dimensions should be easily read from any position. ....
35. A dotted line denotes an extension line. ....
36. The three views of an object should be in the shape of an "L." ....
37. Lettering is not very important to a draftsman. ....
38. The ruling pens should be cleaned after every time of use. ....
39. Drawing ink and writing ink will mix readily. ....
40. A knowledge of drafting essentials is useful only to an engineer. ....

Name .....

Number wrong subtracted from number right gives

Score .....

Industrial-Arts Test No. 4

Completion Test for Wood Finishing

DIRECTIONS: In this test you will find a number of statements with one or more words omitted. You are to fill in the missing words in the space provided to make the sentences complete and correct. *Do not guess.*

1. .... stain raises the grain of the wood.
2. The natural color of shellac is .....
3. Varnish is a .... liquid.
4. The shellac brush is cleaned in .....
5. Outside paint is thinned with .....
6. No sandpaper heavier than .... is used to sand between shellac coats.
7. Inside paint should be thinned with .....
8. A very thin coat of .... is brushed over the stain.
9. The metal containers are for all ..... and .....
10. Oil stain brushes are cleaned in .....
11. Lacquer is similar to .... in speed of drying.
12. Water is very good to clean .... brushes in.
13. .... is used on open-grained woods to get a smooth surface.
14. Stain is used to .... of the wood.
15. .... is used for the final rub on a varnish finish.
16. The base or pigment of all paint is .....
17. Before painting cover all knots with .....
18. Oil stain sometimes produces a .... effect.
19. Shellac prevents the stain from .... the finish.
20. The fumes of ammonia will cause a .... with certain woods.
21. Clear lacquer is sometimes used in place of .....
22. Shellac will .... when bumped or scratched.
23. A wax finish is sometimes used in place of a .....
24. Oil rubbed on the back of sandpaper .... it from .....
25. Brushes should be suspended in a liquid, to ....; to keep ....; and to let .....

Key

1. water
2. orange
3. colorless
4. alcohol
5. linseed oil
6. 2/0
7. turpentine
8. shellac
9. oily rags; waste
10. turpentine
11. shellac
12. water stain
13. filler
14. color grain
15. pumice stone
16. lead
17. shellac
18. muddy
19. bleeding through
20. chemical action
21. varnish
22. turn white
23. varnish
24. keeps; scratching
25. keep soft; bristles straight; dirt settle

Mechanical-Drawing Test

R. N. Donelson

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Name .....
(Print) Last name First name
Class .... Age .... Yrs. .... Mos. ....
First Test — Date ..... No. Right. ....
Score ..... %.
Second Test — Date ..... No. Right ....
Score ..... %.
Growth measured in per cent ..... %.
How long have you had mechanical drawing in this school? ..... Hrs.
Have you had mechanical drawing in any other school? ..... No. of school. .....
How long did you have mechanical drawing in the other school? ..... Hrs.

DIRECTIONS: Underscore the statement which makes the best answer. Only one answer is correct. Answer each question, as your score is based upon the number of questions which you answer correctly.

1. The best pencil to make a sketch with is: (1) HB; (2) 6H; (3) 4H; (4) 6B; (5) 4B.
2. The proper pencil to use in making a mechanical drawing is: (1) 3B; (2) 4H; (3) HB; (4) 9H; (5) 4B.
3. The term 4H printed on a pencil means the pencil is: (1) hard; (2) soft; (3) medium; (4) of good quality; (5) very soft.
4. The drawing pencil is sharpened with a chisel point so: (1) it will draw a straight line; (2) the point will not get dull quickly; (3) it will draw dark lines; (4) curved lines can be drawn; (5) arrowheads can be made easily.
5. In making a sketch: (1) a pencil, scale, and eraser should be used; (2) a pencil, rule, and eraser should be used; (3) a pencil, eraser, and T square should be used; (4) a pencil, eraser, and compass should be used; (5) all of the drawing instruments may be used.
6. If a sketch is in proportion it means that: (1) the sketch is in the center of the paper; (2) all lines are straight; (3) all parts are of the proper relative size; (4) the sketch is made with the proper pencil; (5) the sketch has three views.
7. An oblique drawing is: (1) a drawing with slanting lines; (2) an isometric drawing; (3) a mechanical drawing; (4) any three-view drawing with oblique lines; (5) a picture drawing.
8. Another name for cavalier projection is: (1) isometric projection; (2) orthographic projection; (3) oblique projection; (4) auxiliary projection; (5) clinographic projection.
9. The oblique lines of an isometric drawing are made at an angle to the horizontal of: (1) 30 degrees; (2) 45 degrees; (3) 60 degrees; (4) 90 degrees; (5) 17½ degrees.
10. In an oblique drawing the oblique lines are made: (1) ¼ size; (2) ½ size; (3) ¾ size; (4) full size; (5) 1½ times full size.
11. A circle on an oblique drawing, if it is on the surface facing the observer appears as: (1) a parabola; (2) a hyperbola; (3) a circle; (4) a straight line; (5) an ellipse.
12. A circle on an isometric drawing appears as: (1) a parabola; (2) a hyperbola; (3) a circle; (4) a straight line; (5) an ellipse.
13. Isometric drawings are used because: (1) they are easy to read; (2) they are easy to make; (3) they show all the hidden parts; (4) they take up less space than a three-view drawing; (5) mechanics prefer to work from them.
14. A cabinet drawing is most similar to: (1) a perspective drawing; (2) an isometric drawing; (3) a mechanical drawing; (4) an oblique drawing; (5) an architectural drawing.
15. In a cabinet drawing the oblique lines are made: (1) ¼ size; (2) ½ size; (3) ¾ size; (4) full size; (5) 1½ times full size.
16. When the drawing pencil is sharpened with both a chisel point and a round point, the round point is used: (1) to draw guide lines; (2) to draw cutting lines; (3) to draw dark lines; (4) to make a dot on the paper when measuring; (5) to draw light lines.
17. All lines on a mechanical drawing should be: (1) light; (2) dark; (3) medium; (4) thin; (5) thick.
18. The T square is used by a right-handed person with the head on: (1) the left side of the drawing board; (2) the right side of the drawing board; (3) the bottom of the drawing board; (4) the top of the drawing board; (5) either side.
19. Horizontal lines on a drawing are drawn by a person who uses his right hand: (1) from right to left; (2) from left to right; (3) either way; (4) usually from right to left but sometimes the opposite way; (5) half to the left and half to the right.
20. To draw a vertical line use: (1) a T square; (2) a triangle; (3) an architect's scale; (4) a T square and triangle; (5) two triangles.
21. Border lines should be made: (1) light; (2) medium; (3) dark; (4) thick; (5) either dark or medium.
22. Border lines are drawn around the drawing: (1) to make it easy to center the drawing; (2) so the edge of the paper may be cut off evenly after the drawing is finished; (3) so the paper may be fastened straight on the board; (4) so the lettering can be done easily; (5) so the drawing will look better.
23. Every circle shown on a drawing should have: (1) one center line; (2) two center lines; (3) three center lines; (4) no center lines; (5) an odd number of center lines.
24. On a picture drawing of a cylindrical object it is necessary to draw: (1) one center line; (2) two center lines; (3) three center lines; (4) no center lines; (5) more than three center lines.
25. A bow pen is: (1) a pen used in lettering; (2) a pen used to draw straight lines; (3) a pen used to draw curved lines; (4) a compass used to draw small ink circles; (5) a pen used when a French curve is used.
26. In inking a drawing which has circles,

horizontal lines, and vertical lines (1) ink the horizontal lines first, the vertical lines second, and the circles last; (2) ink the vertical lines first, the horizontal lines second, and the circles last; (3) ink the circles first, the vertical lines second, and the horizontal lines last; (4) ink the circles first, the horizontal lines second, and the vertical lines last; (5) ink the horizontal lines first, the circles second, and the vertical lines last.

27. For ink work, the pen used to draw straight lines is called: (1) bow pen; (2) crow quill pen; (3) ruling pen; (4) drop pen; (5) contour pen.

28. To do good lettering: (1) light lettering guide lines should be drawn; (2) fine lettering guide lines should be drawn; (3) no guide lines need be drawn; (4) dotted guide lines should be drawn; (5) either dark or light guide lines may be drawn.

29. The surface of a screw thread is a: (1) straight line; (2) French curve; (3) parabola; (4) helicoid; (5) hyperbola.

30. Most mechanical drawings have: (1) one view; (2) two views; (3) three views; (4) four views; (5) five views.

31. The front view of a mechanical drawing usually shows: (1) the height and width of the object; (2) the width; (3) the length and width; (4) the length, width, and height; (5) the length and height.

32. To make a complete drawing of a solid right cylinder it is necessary to draw: (1) one view; (2) two views; (3) three views; (4) a sectional view; (5) an auxiliary view.

33. In making a pencil drawing of a cylindrical object: (1) the view which shows the circles should be drawn first; (2) the top view should be drawn first; (3) the front view should be drawn first; (4) either view may be drawn first; (5) the view which does not show the circles should be drawn first.

34. If two views of a right cylinder are drawn, and one of these views is a circle, the other view will be: (1) an ellipse; (2) a circle; (3) a parallelogram; (4) a rectangle; (5) a triangle.

35. In a three-view drawing, the top view is placed: (1) over the side view; (2) below the side view; (3) to the left of the front view; (4) to the right of the front view; (5) above the front view.

36. To understand a mechanical drawing, it is necessary to examine: (1) the top view; (2) the front view; (3) the side view; (4) any single view; (5) all the views given.

37. A mechanic prefers a mechanical drawing to guide him in his work instead of a picture drawing because: (1) anyone can understand a mechanical drawing; (2) a mechanical drawing is cheaper; (3) a mechanical drawing shows the proper size and shape of every part of the object; (4) a mechanic cannot read a picture drawing; (5) a picture drawing shows more than the mechanic needs to know about the object.

38. In a circle there are: (1) 100 degrees; (2) 180 degrees; (3) 90 degrees; (4) 360 degrees; (5) 45 degrees.

39. In a drawing of a cylinder, if the top view is a circle and the front view is a square, the height of the cylinder is: (1) twice as great as the diameter; (2) one half as great as the diameter; (3) equal to the diameter; (4) equal to the radius; (5) 3 1/7 times the diameter.

40. The term "2-inch circle" means: (1) the radius of the circle is 2 inches; (2) the diameter of the circle is 2 inches; (3) the circumference of the circle is 2 inches; (4) the chord of the circle is 2 inches; (5) the diameter of the circle is 1 inch.

41. Dimension lines should be made: (1) light; (2) thick; (3) dark; (4) either dark or light; (5) medium.

42. When a dimension is placed near a view, the space between the dimension and the view should be at least: (1) 1/16 in.; (2) ⅛ in.; (3) ¼ in.; (4) ⅜ in.; (5) ½ in.

43. In vertical dimensions the figures should be placed so that they may be read from: (1) the bottom of the paper; (2) the top of the paper; (3) the left side of the paper; (4) the right side of the paper; (5) either side of the paper.

44. To stagger dimensions means: (1) to place them in line with each other; (2) to place one above the other; (3) to place them between views; (4) to place them upside down; (5) to place them on opposite sides of a center line.

45. Arrowheads on dimension lines should be made: (1) freehand; (2) with a triangle; (3) with a scale; (4) with the T square held in a slanting position; (5) with a bow pencil.

46. Dimensions on an isometric drawing should be placed only on: (1) horizontal lines; (2) vertical lines; (3) isometric lines; (4) nonisometric lines; (5) any line.

47. Sectional views are most commonly used on: (1) square objects; (2) cylindrical objects; (3) rectangular objects; (4) picture drawings; (5) pattern developments.

48. When a sectional view is drawn the draftsman (1) imagines that a portion of the object is cut away; (2) draws the object as it actually appears; (3) draws only one half of the object; (4) imagines the object is cut in three parts; (5) constructs an auxiliary view.

49. A sectional view is used: (1) to show the inside construction of an object; (2) to save space; (3) to save drawing one view; (4) to make the drawing look better; (5) to show what material the object is made of.

50. Cross hatching is used in: (1) pattern development; (2) a sectional view; (3) an auxiliary view; (4) a cabinet drawing; (5) a picture drawing.

51. A revolved section is used: (1) to save space; (2) to show what kind of material the object is made of; (3) to make the drawing look better; (4) in place of a sectional view; (5) to show the shape of some part or detail of an object.

52. In a three-view drawing if the front view is drawn in full section: (1) only half of the top view is drawn; (2) the side view must also be drawn in full section; (3) the side view must be drawn in half section; (4) the top view is drawn in full section; (5) the top view and side view are not affected.

53. A scale is used: (1) to draw horizontal lines; (2) to measure; (3) as a straight edge; (4) to draw vertical lines; (5) to draw border lines.

54. If the scale of a drawing is half size, the dimensions given on the drawing are: (1) the size of the object; (2) the size of the drawing; (3) one half the size of the drawing; (4) one half the size of the object; (5) two times the size of the object.

55. The term "half scale" means: (1) the object is one half as big as the drawing; (2) a six-inch scale was used in making the drawing; (3) the drawing is made with a half-inch space between views; (4) the drawing is twice as big as the object; (5) the drawing is one half as big as the object.

56. In drawing the pattern for a cone, it is necessary to use: (1) a conical helix; (2) a compass; (3) a French curve; (4) an irregular curve; (5) a T square.

57. In drawing the pattern of a right cylinder cut off at an angle on one end, it is necessary to use: (1) a French curve; (2) a compass; (3) an ellipsograph; (4) a bow pencil; (5) a steel scale.

58. A development of a cylinder means: (1) a sectional view of a cylinder; (2) a drawing of a cylinder; (3) the front view of a cylinder; (4) a pattern of a cylinder; (5) two views of a cylinder.

59. A break is used when drawing long regular pieces: (1) to make the drawing clearer; (2) to make the drawing look better; (3) to save drawing one view; (4) to show the shape of the object; (5) to save space.

60. Usually, when drawing screw threads: (1) they are drawn exactly as they appear; (2) symbols are used to represent them; (3) a sectional view must be used; (4) three views of the object must be drawn; (5) an irregular curve must be used.

61. The term "a tapped hole" means: (1) a square hole; (2) a hole which is threaded inside; (3) a hole made with a drill; (4) a hole which does not go all the way through the object; (5) a hole made with a punch.

62. In a three-view drawing in which a tapped hole occurs it is necessary to show the tapped hole in: (1) the top view only; (2) the front view only; (3) the side view only; (4) the top and front views only; (5) all three views.

63. In the symbol for a tapped hole in which slanting lines are used, these lines must slant: (1) at an angle of 15 degrees; (2) at an angle of 22½ degrees; (3) at an angle of 30 degrees; (4) at any small angle which looks well on the drawing; (5) at the same angle at which the threads slant on the object which is being drawn.

64. In using a French curve, it is necessary to connect at least: (1) two points at a time; (2) three points at a time; (3) four points at a time; (4) five points at a time; (5) any number of points may be connected at one time.

65. A knurled surface is: (1) a rough surface; (2) a smooth surface; (3) a varnished surface; (4) a highly polished surface; (5) any metallic surface.

66. Architectural drawing deals with the drawing of: (1) furniture; (2) the drawing of sheet-metal patterns; (3) the drawing of machines; (4) the drawing of buildings; (5) the drawing of maps.

67. Fillets are used on machine parts: (1) to make the metal cool quicker when the object is cast; (2) to make them easier to draw; (3) to make them look better; (4) to

save metal; (5) to make them stronger.

68. Cross-section paper is used: (1) to make tracings on; (2) to make mechanical drawings on; (3) to make sketches on; (4) to make blueprints on; (5) to make sectional-view drawings on.

69. A blueprint is best made from: (1) a sketch; (2) an ink tracing; (3) a pencil drawing; (4) a pencil tracing; (5) an ink drawing.

Key — Mechanical-Drawing Test

1. 1	8. 3	15. 2	22. 5	29. 4	36. 5	43. 4	50. 2	57. 1	64. 2
2. 2	9. 1	16. 4	23. 2	30. 3	37. 3	44. 5	51. 5	58. 4	65. 1
3. 1	10. 4	17. 4	24. 4	31. 5	38. 4	45. 1	52. 5	59. 5	66. 4
4. 2	11. 3	18. 1	25. 4	32. 2	39. 3	46. 3	53. 2	60. 2	67. 5
5. 2	12. 5	19. 2	26. 4	33. 1	40. 2	47. 2	54. 1	61. 2	68. 3
6. 3	13. 1	20. 4	27. 3	34. 4	41. 1	48. 1	55. 5	62. 5	69. 2
7. 5	14. 4	21. 3	28. 1	35. 5	42. 3	49. 1	56. 2	63. 4	

Printing Tests

Frank Di Giacomo

Instructor of Printing,
Stuart Junior High School,
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A worth-while test which will interest the printshop teacher.

Name..... Grade... Date.....

DIRECTIONS: Some of the following statements are true and some are false. On the blank line provided write the word *true* if the statement is true and the word *false* if the statement is false.

Two points are deducted for each statement marked incorrectly. If you do not know whether a statement is true or false, leave it blank.

1. ..... Type is set in adjustable three-sided trays called composing sticks.
2. ..... A brayer is a small roller used in locking a form.
3. ..... An imposing stone is a stone-surfaced table upon which paper is cut.
4. ..... A proof planer and a type planer are the same.
5. ..... Spaces and quads are used in tightening type in the stick.
6. ..... Leads and slugs are the same height as type.
7. ..... Setting type in the stick is called composing type.
8. ..... Type is read nicks up from right to left.
9. ..... The stick is always held in the left hand open side up.
10. ..... The four demons include the 6 and 9.
11. ..... The most confusing letters in type are the b, d, p, q.
12. ..... A proof is an impression of the type form.
13. ..... A revised proof always contains errors.
14. ..... Margin is allowed on a proof for marking errors.
15. ..... A proof is lifted from the form by opposite corners.
16. ..... Tightening lines in the stick is called justifying.
17. ..... Spaces are used between lines.
18. ..... Quads are used to fill in a line to measure.
19. ..... An em quad is always the square of the size of type used.
20. ..... An en quad is one half the em quad.
21. ..... Leads and slugs are used to space words in a line.
22. ..... Short letters require less space between them.
23. ..... Words are divided at the end of lines at syllables.
24. ..... Dele in proofreading means take out.
25. ..... A wrong font is a letter of a different style or size.
26. ..... The mark for capital is cap.
27. ..... Quoins are used to plane type forms in lockup.
28. ..... A type planer and a proof planer are different.
29. ..... The part of the press against which forms rest is called bed.
30. ..... The chase clamp holds the paper in place for printing.
31. ..... The feed board holds the paper ready for printing.
32. ..... The press is never oiled while in motion.
33. ..... Feeding is the process of putting ink on the press.
34. ..... Fanning means separating the sheets of paper.
35. ..... Gripper fingers are metal strips which hold the paper down on the platen.
36. ..... Nicks are used to make the type lighter.
37. ..... A dead form is one ready for printing.
38. ..... Pi is a kind of dessert liked by printers.
39. ..... The lower case is alphabetically arranged.
40. ..... The small e is the most used letter in the English language.
41. ..... Oil sheets are used to reduce the friction on the disk.
42. ..... Words which end and begin with short round letters need less space between them.
43. ..... Text types are used mostly for book work because of their legibility.
44. ..... Italic types are used to a large extent for emphasis and contrast with Roman types.
45. ..... Roman types are not used in books because they are not legible.
46. ..... Sans-serif types in the smaller sizes are used for professional stationery.
47. ..... Type which is neatly arranged in a form is called pi.
48. ..... The skill of lettering is essential to good typography.
49. ..... The point is the basis for printer's measurement.
50. ..... Newsprint stock is mostly used for writing paper.
51. ..... The arrangement of the lowercase letters is alphabetical.
52. ..... The capital section is alphabetical with the exception of J and U.
53. ..... Solid type matter always has two-point leads between each line.
54. ..... Corrections should be made in the stick to insure proper justification.
55. ..... The printers' knot is made when the form is tied.
56. ..... Type is distributed starting from the right side of the line.
57. ..... Distribution is the process of returning type to the proper boxes in the case.
58. ..... Antimony is the main ingredient in foundry type.
59. ..... The pica is the unit of length in printing measurements.
60. ..... In one inch there are 72 points.
61. ..... Script types are cast to imitate handwriting.
62. ..... A series of type contains a number of sizes of the same style.
63. ..... Type is off its feet when it does not rest squarely on its feet.
64. ..... The class of letters which lean toward the right is italic.
65. ..... A type planer is also used for taking stone proofs.
66. ..... Most paper stock is sold in reams of 500 sheets.
67. ..... The figures 17 by 22–20 indicate the size and weight of paper.
68. ..... A dirty proof is free from all errors.
69. ..... Kerosene is most commonly used to wash the press.
70. ..... Bond paper is the stock most used for business stationery.
71. ..... Tympan is the name given to the packing and the top sheet.
72. ..... Cuneiforms were cut in clay by the ancient Babylonians.
73. ..... Hieroglyphics was a form of writing used by the Greeks.
74. ..... Our alphabet was originated by the seafaring Phoenicians.
75. ..... Foundry types contain less lead than linotype.
76. ..... Words should always be divided between syllables.
77. ..... Platen presses are used mostly for large book forms.

78. ..... Glycerin is an important ingredient in printers' rollers.
79. ..... Keeping color means to have enough on the job.
80. ..... Guides are used on the press for measuring paper.
81. ..... Face, groove, feet, and nick are parts of a printing press.
82. ..... The letters most frequently used are centrally located in larger boxes.
83. ..... The gauge on the composing stick is marked off in points.
84. ..... A compositor is a man who sets type into forms for printing.
85. ..... The ordinary paragraph indention is one em.
86. ..... The shoulder on a piece of type allows for descending letters.
87. ..... The throw-off lever on the press regulates the printing impression.
88. ..... Most newspapers are printed on bond paper.
89. ..... Printing is one of the six largest industries in America.
90. ..... The early masters of printing did not use initial letters.
91. ..... A swash letter is an italic letter used for decoration.
92. ..... Type area is always calculated in terms of ems.
93. ..... The better grades of bond paper are mostly of rag content.
94. ..... The main function of type is to be read easily.
95. ..... The style of type on an envelope should follow closely the style on the letterhead.
96. ..... Body type is used for the reading matter on a page.
97. ..... Brass rules may be used as spacing material instead of leads.
98. ..... Display lines are usually set in small light types.
99. ..... Purple ink is obtained by mixing red and blue inks.
100. ..... The primary colors red, orange, and blue.

Completion Test

DIRECTIONS: Fill in the blank spaces with the word or words needed to make a complete sentence.

1. A collection of one size and one style of type is called a ———.
2. The type cases most used in schools are called ———.
3. Two or more letters cast on one body are called ———.
4. The printer's ruler is marked in ———, ———, and ———.
5. A collection of type ready for printing is called a ———.
6. The stick is held in the ——— hand, while the ——— hand picks up the type.
7. Type is always set ——— up.
8. Type is read in the stick from the ——— to ——— side.
9. The four demons are ———, ———, ———, and ———.
10. Some of the confusing types include ———, ———, ———, ———, ———, ———, ———, and ———.
11. The small roller used to ink type forms is called ———.
12. The impression of the type form after it has been set is called a ———.
13. Tightening a line in the stick is called ———.
14. The square quad of type size is called ———.
15. The most commonly used space between words is ———.
16. The smaller spaces in the lower case are ——— and ———.
17. Strips of metal used between lines are called ———.
18. A lead is ——— points; a slug is ——— points.
19. Tall letters need ——— space between them than short letters.
20. Words should always be divided at ———.
21. The symbol for "take out" is ———.
22. The symbol wf. means ———.
23. Type forms are locked up on large tables called ———.
24. The metal frames in which type is locked up are ———.
25. Blocks of wood used around forms in locking are ———.
26. The solid block of wood used to plane type forms is ———.
27. The preparation of forms in the chase is called ———.
28. Wedge-shaped pieces of metal used in lockup are ———.
29. The part of the press which receives the paper for printing is called ———.
30. Name two safety rules for oiling a press: (1) ———; (2) ———.
31. The platform in front of the press which receives printed stock is the ———.
32. The hand control of the impression is called ———.
33. Putting sheets against the guides to be printed is called ———.
34. The process of returning type to their proper boxes is ———.
35. Type which is mixed up is called ———.
36. A form which is held for printing is called a ——— form.
37. The ——— boxes vary in size according to the frequency the letters are used.
38. The capital section of the case is alphabetically arranged except for ——— and ———.
39. Words which end and begin with letters like ———, ———, ———, ———, need more space between them.
40. One inch contains ——— points; ——— picas; ——— nonpareils.
41. The number of picas needed to fill a space two inches is ———.
42. In ten inches there would be ——— slugs.
43. The number of pieces 8½ by 11 that can be cut from one sheet 17 by 22 is ——— and from one ream ——— can be cut.
44. The stock used for business stationery is called ——— paper.
45. Papyrus was paper made from reeds by the ancient ———.
46. Printing from movable types was invented in 1450 by ———.
47. The punctuation mark used for a stop is the ———.
48. Hyphens are used at the ends of lines where words have been divided between ———.
49. Oily rags should always be kept in covered metal ———.
50. A boy who is learning a trade is called an ———.
51. A proof of the type form after setting is taken on the ———.
52. A proof which contains many errors is called a ——— proof.
53. The printer's ruler is called a ———.
54. Aldus Manutius, the Italian printer, designed the ——— types.
55. Type high in America is ——— of an inch.
56. Green ink is made by mixing ——— and ———.
57. Orange ink is made by mixing ——— and ———.
58. The test for ——— is to allow the type line to lean slightly in the stick to see if it is snug in the stick.
59. A stone proof is taken by hand on the stone with a ——— and ——— ———.
60. Before distributing type the ——— and ——— of the type being distributed is compared with that of the type in case.
61. The metal tray in which composed type is stored is called ———.
62. Type which has the same number of spaces and quads on each side is ——— in the stick.
63. An effective initial letter is made by using type of the same ——— at least ——— sizes larger than the body type.
64. Text types are used mostly for ——— printing.
65. Most papers are made from ———.
66. Printing inks are made mostly of colored ——— and ———.
67. For good proportion, the length for a page 4 in. wide is ———.
68. The size most common for business cards is ———.
69. ——— point type is also called pica type.
70. A type line 30 picas wide is ——— inches wide.
71. After a form has been printed the type is said to be ———.
72. The most important printing method is done from ——— surfaces, also called typography.
73. A type page 4 by 6 in. is ——— picas wide and —— in length.
74. Plain block letters without serifs are called ——— types.
75. The quoins in lockup should be placed on the ——— and ——— sides.

Enumeration Test

1. The three most common type cases are the ———, ———, and the ———.
2. The five divisions of the California job case are ———, ———, ———, ———, ———.
3. Ten letters confusing for the beginner are ———, ———, ———, ———, ———, ———, ———, ———, ———, ———.
4. The quads found in the California job cases are ———, ———, ———, ———.
5. The spaces in the California job case are ———, ———, ———.
6. Two typesetting machines are the ——— and ———.
7. Five parts on a piece of type are the ———, ———, ———, ———, ———.
8. Five articles used in locking up a form

are ———, ———, ———, ———, ———.

9. Nine parts of a printing press are the ———, ———, ———, ———, ———, ———, ———, ———, ———.
10. The three ingredients in printing rollers are ———, ———, and ———.
11. The five general classes of paper are ———, ———, ———, ———, ———.
12. The ligatures located in the California job cases are ———, ———, ———, ———, ———.
13. Foundry type is made of an alloy with ———, ———, ———.
14. The five classes of type faces are ———, ———, ———, ———, ———.
15. The primary colors are ———, ———, ———.
16. The secondary colors are ———, ———, ———.
17. The warm colors are ———, ———, ———.
18. The cold colors are ———, ———, ———.
19. The usual items which appear on business stationery are ———, ———, ———, ———.
20. The four different kinds of types are ———, ———, ———, ———.
21. Name the printers in history identified with such of the following: Italics ——— Printing in England ——— Roman type ——— Printing in America ——— Movable types ——— Publishing in America ———.
22. The usual sizes in a series of type are ———, ———, ———, ———, ———, ———, ———, ———, ———, ———, ———, ———.
23. Fill in the blank with the correct proofreaders' mark: Take out ———, wrong font ———, broken letter ———, push down ———, turn letter over ———, lower-case letter ———, capital letter ———, italics ———.
24. The three types of presses for letterpress printing are: ———, ———, ———.
25. Four kinds of indentions are: ———, ———, ———, ———.
26. Three different kinds of ink used for letterpress printing are: ———, ———, ———.
27. Three fundamental principles of display are: ———, ———, ———.

Alternate-Choice Test

DIRECTION: Place a check in the square before the statement or phrase which makes the whole sentence correct and complete.

1. The arrangement which conforms to the correct lay of the case is
   ( ) H, I, J, K, L, M, N, O ( ) G, O, W, & ( ) b, c, d, e, i, s, f, g ( ) l, m, n, o, p
2. The letter to the right of k, above h, to the left of l is ( ) a ( ) i ( ) e ( ) d.
3. Type is set with nicks up because ( ) it makes a better looking type line ( ) it is a matter of custom ( ) it shows that all type is in the correct position.
4. Extra space should be placed between words ending with ( ) descending letters ( ) ascending letters ( ) punctuation marks ( ) quotation marks.
5. Spaces at the end of a type line should be placed ( ) between quads ( ) after the last type ( ) after the quads ( ) before the final quad.
6. The square of the type size is called ( ) pica ( ) em ( ) quad ( ) slug.
7. Typography or letterpress printing is done from ( ) sunken surfaces ( ) raised surfaces ( ) smooth surfaces.
8. Type sizes are designated in terms of ( ) ems ( ) picas ( ) points ( ) nonpareil.
9. The number of pieces 6 by 9 which may be cut from a sheet 25 by 38 is ( ) 12 ( ) 14 ( ) 16 ( ) 18.
10. The printers' system of measurement is based upon the ( ) inch ( ) feet ( ) point ( ) em.
11. A type family refers to ( ) different sizes of type ( ) an assortment of different characters ( ) various series with same basic design ( ) a font of type.
12. A series of type consists of ( ) a font ( ) a family ( ) sorts ( ) various sizes of the same style.
13. When a form fails to lift, the stoneman ( ) drives a match stick between the type ( ) batters the ends of slugs ( ) resets the job ( ) unlocks for and justifies correctly.
14. The optical center of a page is ( ) below the center ( ) in the center ( ) slightly above center ( ) near the top.
15. Book pages have more margin on the ( ) left side ( ) bottom ( ) top ( ) right side.
16. Ink rollers are made mostly of ( ) varnish and syrup ( ) rubber composition ( ) glue, glycerin and molasses.
17. The liquid usually used for washing presses is ( ) gasoline ( ) water ( ) kerosene ( ) alcohol.
18. Makeready in presswork means ( ) locking up the form in cases ( ) inking up the press ( ) making all printing surfaces level ( ) plaining the form on the stone.
19. The alphabet was originated by the ( ) Egyptians ( ) Hebrews ( ) Arabs ( ) Phoenicians.
20. The 42-line bible was printed by ( ) Caxton ( ) Manutius ( ) Gutenberg ( ) Bodoni.
21. The man who introduced printing in the American colonies was ( ) William Bradford ( ) Benjamin Franklin ( ) Stephen Daye ( ) William Caslon.

Safe-Driving Test

O. P. Schneider

Shop Superintendent,
West Technical High School,
Cleveland, Ohio.

An excellent test for the students of the automotive department.

Directions: Below are a number of incomplete statements. After each statement, there are five phrases or words each preceded by a number. You are to check the correct answer and write its number in the parentheses.

Test in Safe Driving Practices

Score ( )

I. In approaching a street intersection, the right of way belongs to the car approaching from the: ( ) I
1. Either way
2. Right
3. Rear
4. Left
5. Front

II. The number of miles per hour permitted in the State of Ohio in all portions of municipal corporations except business and congested areas is: ( ) II
1. Twenty
2. Thirty-five
3. Forty-five
4. Fifteen
5. Twenty-five

III. When school busses stop outside of corporate limits, the state law provides that cars must come to a stop when approaching from: ( ) III
1. Front
2. Rear
3. Front and rear
4. Right side
5. Left side

IV. The greater number of accidents from the standpoint of the motorist is caused by: ( ) IV
1. Defective mechanism
2. Intoxicated drivers
3. Reckless driving
4. Ignorance of traffic laws
5. Congested traffic

V. In an effort to regain control of a skidding car, the steering wheel should be: ( ) V
1. Held rigid
2. Turned in the direction of the skid
3. Turned opposite the direction of the skid
4. Alowed to turn of its own accord
5. Turned first to right and then to left

VI. Ohio laws provide that headlights on motor vehicles must be equipped with nonglare devices and lights not in excess of (candlepower): ( ) VI
1. Twenty-one
2. Thirty-two
3. Ten
4. Fifty
5. Fifteen

VII. The legal minimum age in Cleveland for any driver of a motor vehicle is:

1. Sixteen years
2. Eighteen years
3. Twenty-one years
4. Fifteen years
5. Twenty years

Directions: Read each statement or question. Then select the answer from the following list which best fits, and write its number in the parentheses.

List of Answers

1. Drunkenness
2. Coast across
3. Stop and wait for opening
4. Walk facing the traffic
5. Slow
6. Jaywalking
7. Rear wheels
8. Lights
9. Walk in same directions
10. Front wheels
11. Pull to right and wait for green light
12. 15 miles per hour
13. Signal with hand and proceed
14. Pull to curb and stop
15. Steering
16. Parking
17. Passing
18. Stop
19. Caution
20. Hand
21. Recklessnessness

Test in Safe Driving Practices

1. In case of wide streets or roads having an odd number of marked lanes, the "odd" or center lane should be used for ( ) 1
2. When walking on traveled highway, pedestrians should ( ) 2
3. The greater number of traffic accidents due to the fault of the pedestrian result from ( ) 3
4. It is better to have your best tires on the ( ) 4
5. At all unguarded railroad crossings, motorists should ( ) 5
6. In the vicinity of schools, during school hours, the law says traffic should proceed with ( ) 6
7. In joining the flow of traffic on a main thoroughfare, from an intersecting secondary road, the proper procedure is to ( ) 7
8. When overtaken by a fire apparatus, the proper procedure is to ( ) 8
9. In making a left turn in Cleveland at a traffic-light intersection, the required procedure is to ( ) 9
10. In the "shorthand" of highway signs, the diamond shape generally means ( ) 10
11. A signal given by the driver ahead with the arm pointing down to the road means he is going to ( ) 11
12. Wheels out of line may cause difficulty in ( ) 12
13. To conform with safe driving practices at night, car speed should be reduced so as not to overdrive the ( ) 13
14. If a driver has to stop while going uphill, it is better to start by gradually engaging the clutch and slowly releasing the brake by ( ) 14

Problems and Projects

CANDLE ORNAMENT

Colin D. Robertson, Jamaica Vocational High School, Jamaica, New York

Steps

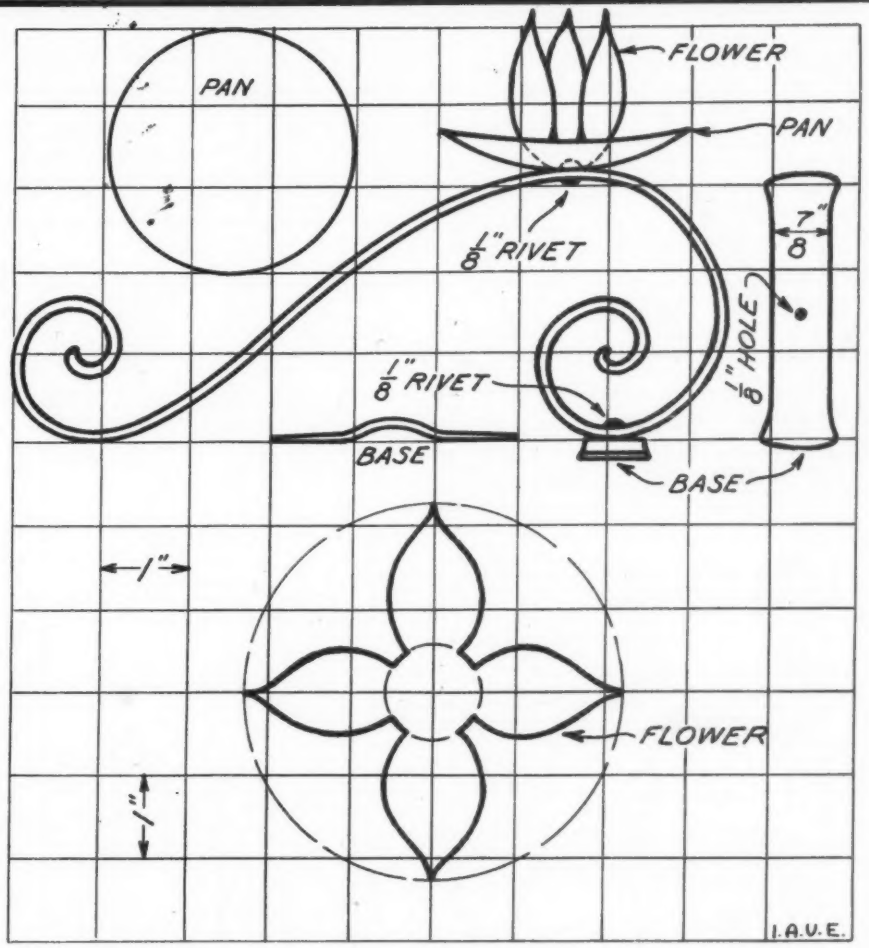
1. Make a full-size drawing.
2. Take the measurements of the stock from your drawing.
3. Use ⅛ by ½-in. band iron for the long scroll piece, and ⅛ by ¾-in. band iron for the base.
4. Use scrap sheet iron for the pan and flower.
5. Raise the pan with a ball-peen hammer.
6. Form the flower on a piece of ½-in. pipe.
7. Shape the long scroll on the anvil.
8. Make a "jump-over" on the base to permit the rivet to clear.
9. Drill holes for rivets and rivet parts.
10. Paint with black enamel and blow on bronze powder.

A METAL PICTURE FRAME

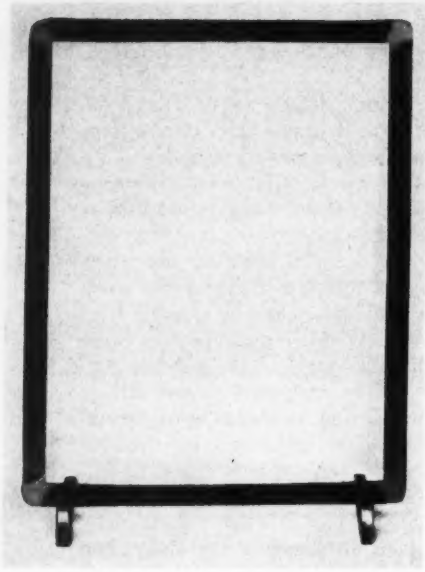
S. H. Puehler, Milwaukee Public Schools, Milwaukee, Wisconsin

Many of the current homecraft magazines have devoted considerable space to the making of wooden picture frames. The student of metalwork, however, can also make good-looking frames of iron, copper, or brass. The one described herein is made of ordinary ½ by ½-in. black angle iron.

The layout for the four corners is first marked on the length of material chosen. The metal is then miter cut, filed, and bent to shape. After being bent, the corners are soldered together. Various shaped pieces of iron, copper, or brass may be sweated on to the frame at the corners or at other positions for decorative purposes, and, if desired, the surface and edges may be filed depicting a variety of simple designs.



The frame may be hung on the wall, or two feet may be attached for standing purposes. The template herein is the exact size of ¼-in. material necessary for the two feet. The feet



are fastened to the frame by rivets or solder.

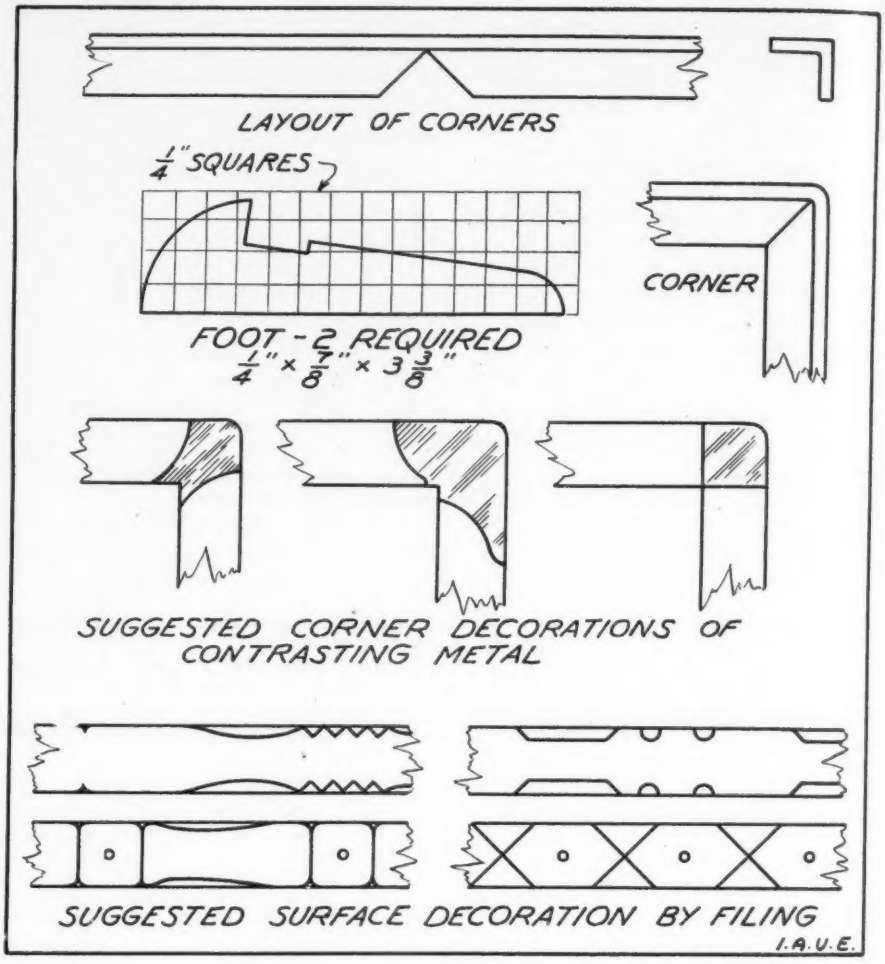
The glass, picture, and backing is held in the frame by soldering lugs onto the back of the frame after the parts are enclosed.

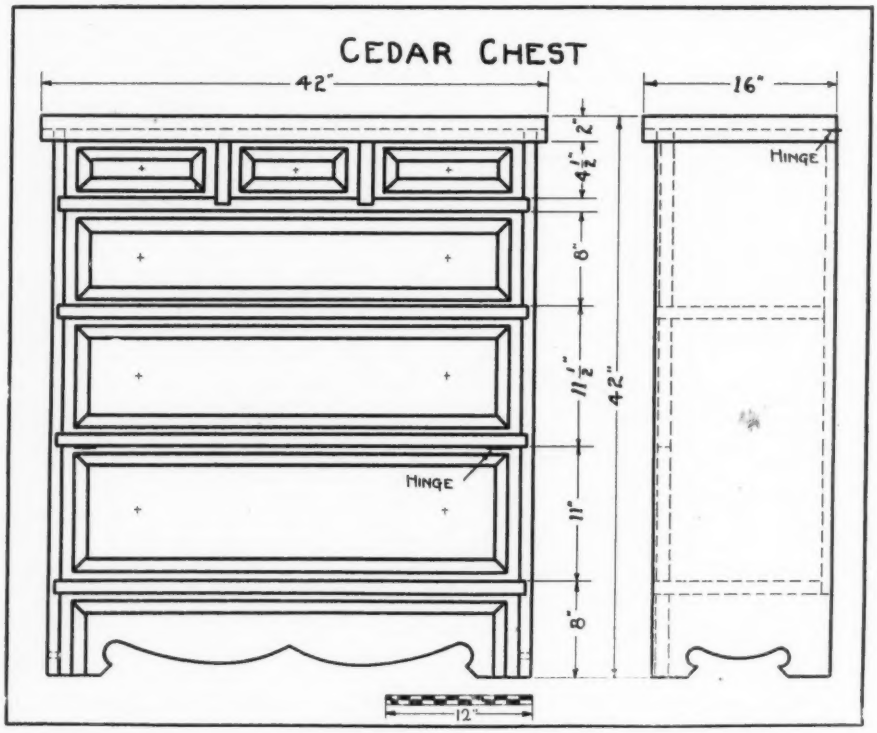
The frame is protected by a coating of lacquer, wax, or varnish.

CEDAR CHEST

G. Harold Billingham, Woodrow Wilson High School, Weehawken, New Jersey

The average cedar chest either does not hold enough or else is likely to be clumsy. Besides, it takes up considerable floor space, considering its height.





To obviate these objections, we designed this cabinet and built it in our shop at a very low cost, considering the materials.

At first glance, it appears to be a six-drawer affair, but this is for effect only. The top is made so that it lifts up, being hinged at the back. This allows access to a compartment 38 by 14½ by 14 in., the size of an average cedar chest. Pulling on the handles of the middle large "drawer," reveals a door which opens out, leading to a larger compartment 38 by 21½ by 14 in. These two storage spaces are more than adequate for the average family, and they do not require much floor space.

This particular job was made entirely of cedar except for the panel effects, and the baseboard. The sides were glued up of several boards, matched for grain, and were not paneled. Grooves were sawed in these for the bottom of each compartment. The other two places which appear from the front to be cut through are simply notched in ¼ in. to make the "drawers" appear usable. Each piece was sanded by machine before being used, and afterwards by hand to smooth off the places that had been filled with plastic wood. Natural finish would make this project appear very large, so it was filled with a walnut oil filler, allowed to dry well, and rubbed off with burlap. It was then sanded lightly, and a thin

coat of shellac applied. This was followed by another coat of shellac, sanded lightly, then varnished three times, each coat being rubbed with pumice stone. This gave a fine polish, and showed up the grain which had been selected very carefully.

CANOE PADDLE

Frank Cerveny, Crane Technical High School, Chicago, Illinois

The canoe paddle is an interesting problem for the boy who does canoeing. The grip shown fits the hand easily and allows the fingers to close, thus holding the paddle securely. The blade can be made wider if desired, but for all-day paddling, a 6-in. blade will be found to be quite sufficient. Saturating the paddle with boiled linseed oil thinned with turpentine, prevents the paddle from becoming water-logged when the varnish is scratched through. The oil also binds the grain of the wood together so that the end of the paddle will fray instead of split when it is used as a "push stick" among rocks, or in shallow-river work.

To get the outline of the paddle on the board, a full-size pattern had best be made. Divide the paddle into three parts. Make a full-size drawing of each portion on heavy drawing paper, and then piece them together along their center line on the board and draw the outline. The material used is quarter-sawed, straight-grained, clear spruce.

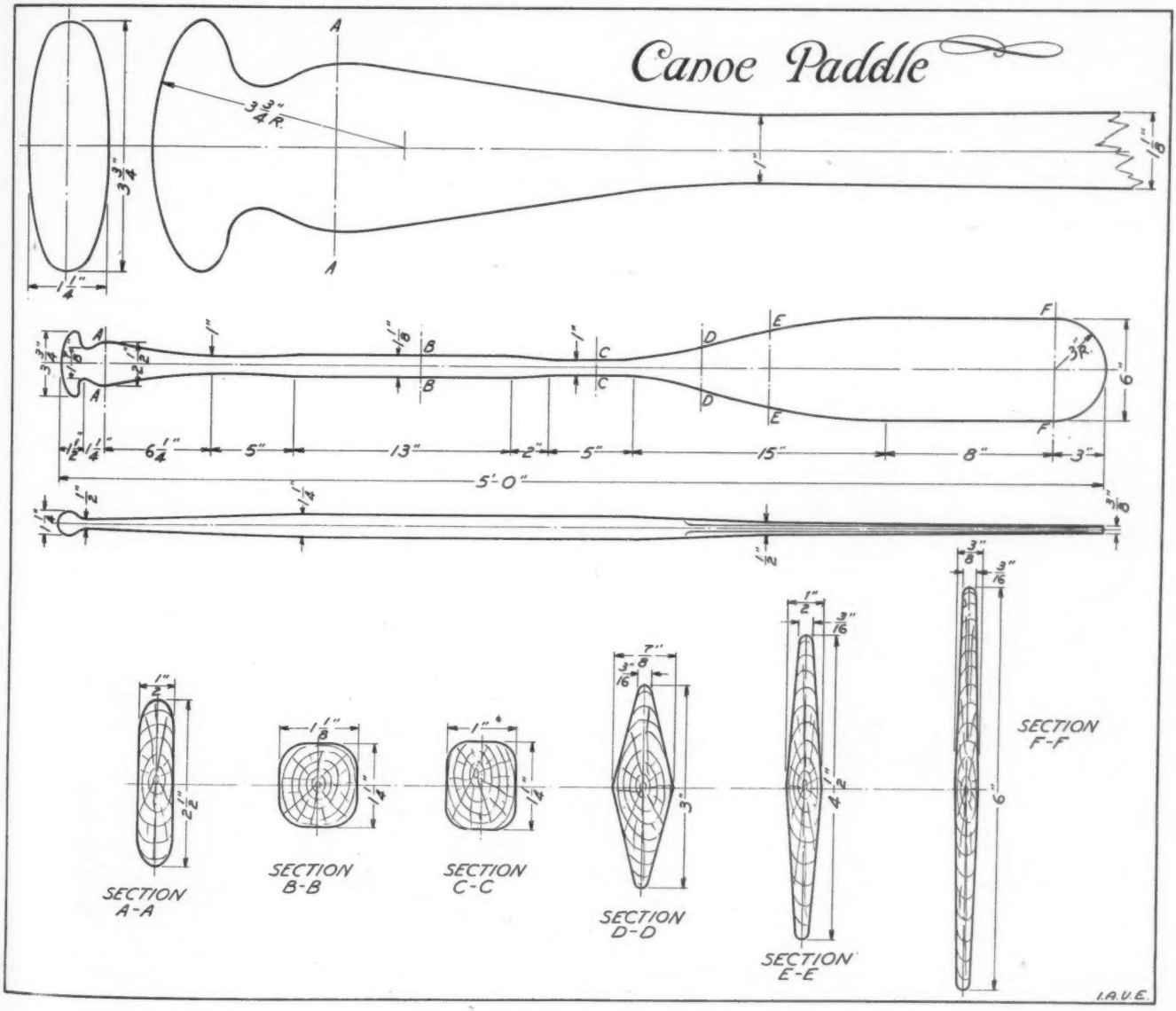
The method of procedure in making the paddle is as follows:

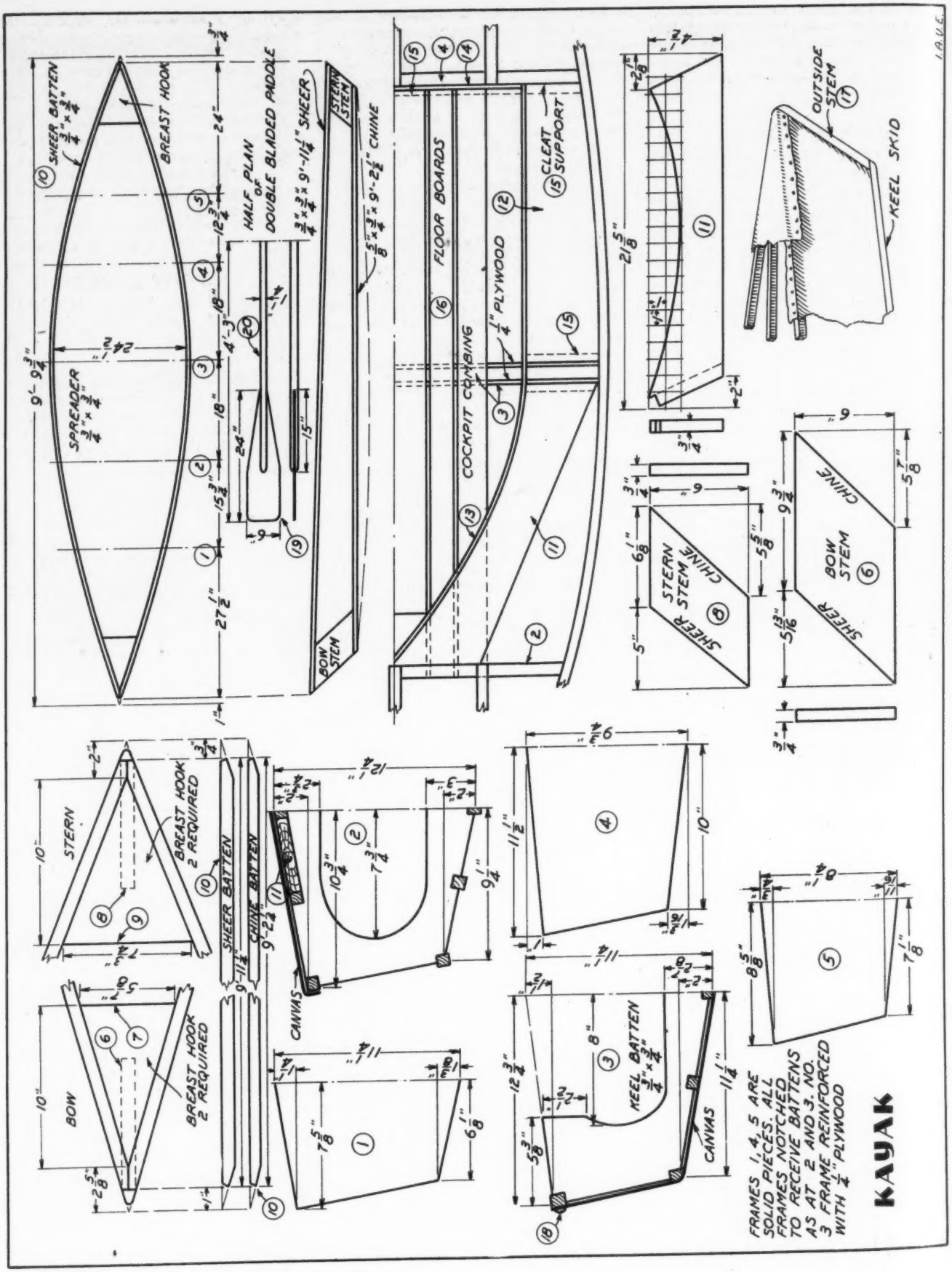
1. Plane the material to size and draw a light pencil center line on both faces.
2. With thumbtacks, fasten the pattern to the board so that the center lines coincide, and draw the outline.
3. Cut out the paddle with the band saw and square up edges with the spokeshave.
4. Using pencil lines, lay out on the edge of the board the thickness of the blade, and outlines of the upper and lower grips.
5. Using the band saw, cut off the sides of the blade and upper grips.
6. With the spokeshave bring the blade to uniform thickness. Do not as yet taper it from the center to edges.
7. Using a spokeshave, ¼-in. chisel, and a round and a half-round file, shape out the upper grip.
8. Taper the blade from mid rib to edge.
9. Round off the edges and finish the lower grip and shaft.
10. Sandpaper perfectly smooth.
11. Thoroughly saturate the paddle with boiled linseed oil thinned with turpentine, and allow it to dry for at least a week.
12. Give it a coat of white shellac, using shellac that has been made very thin with alcohol.
13. Rub smooth with fine steel wool.
14. Give two coats of good spar varnish.

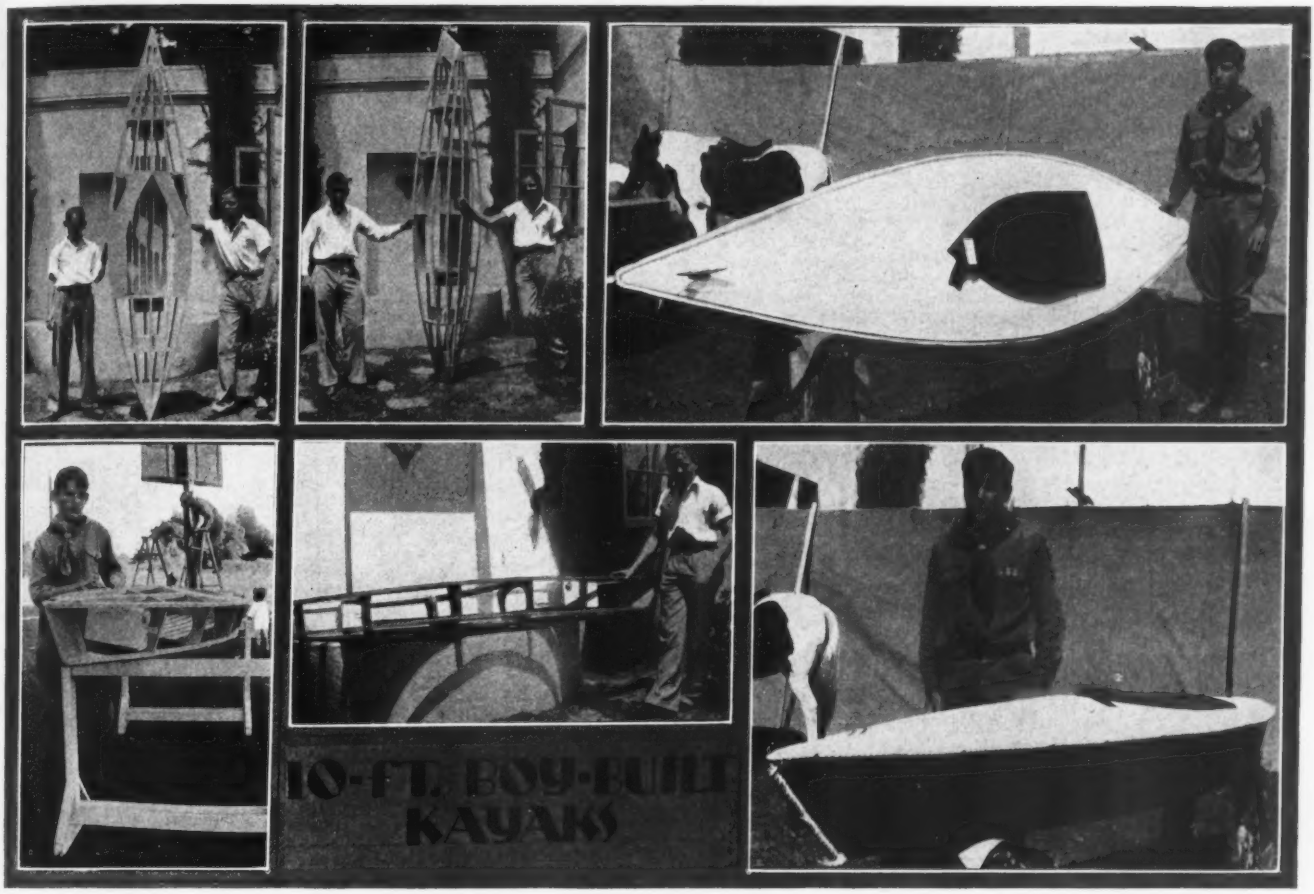
10-FOOT KAYAK

James McGregor, Polytechnic Elementary and Junior High School, Pasadena, California

This type of kayak has been very much in demand. It is easily handled and transported, its construction is simple, and its cost very low. The weight when finished, including paint, is 35 lb., and the average junior-high-school boy can finish this project in from 60 to 70




KAYAK
FRAMES 1, 4, 5 ARE SOLID PIECES. ALL FRAMES NOTCHED TO RECEIVE BATTENS AS AT 2 AND 3. NO. 3 FRAME REINFORCED WITH ¼" PLYWOOD
SHEER BATTEN
BREAST HOOK
HALF PLAN OF DOUBLE BLADED PADDLE
SPREADER
STEM
BOW
STERN
FLOOR BOARDS
COCKPIT COMBING
CLEAT SUPPORT
¼" PLYWOOD
OUTSIDE STEM
KEEL SKID
CHINE
KEEL BATTEN
CANVAS
2 REQUIRED



hours. While not so speedy as the long, narrow ones ranging from 14 to 16 ft. in length, this kayak is quite steady and handles easily.

Because safety should not be neglected in this project, choose only such boys as are able to handle required tools, and who possess perseverance enough to stay on a job which takes longer than the average. Evidence of swimming ability also should be obtained from each boy. This may often be had through scout masters or camp counselors. The consent of parents is also desirable.

As a junior-high-school project and also senior high school, the kayak can be recommended as an extremely useful project from which the boy can derive many happy and healthful hours in his outdoor life. It is a project which keeps interest running high. It is true that there are obstacles to overcome, such as the cost of construction and lack of space for building. The cost can be spread if two or more boys build a boat together, or by forming kayak clubs where funds are pooled to build several boats. A kayak club will stimulate interest in better and more careful workmanship if several groups compete to see which can build the best and speediest craft.

Method of Procedure

Make two of each of breast hooks No. 7 and 9, also two sheer battens, and two chine battens mitering the ends of each piece. The miters are not 45 deg. but are obtained by using the 2 in. and 2⅝-in. measurements shown in the detail drawing. Accurate measuring and careful cutting will, of course, assure a better balanced craft. Fasten sheer battens to breast hooks, using casein glue and brass screws. Steaming or soaking in water, as a rule, is not necessary except for chine battens. However, if the spruce is very dry, soaking battens in water overnight will prevent any possible breakage in bending. The sheer battens are spread 24½ in. at position marked frame No. 3 in the plan. Before gluing and fastening, a dry trial assembly on the floor with hand screws is advisable.

Make the chine assembly in a similar manner, spreading 21½ in. at frame No. 3. Rip chine battens to ⅝ by ¾ in. and soak in water overnight. This is necessary due to the short length and sharp curve. Make bow and stern stems and fasten to sheer and chine assemblies with casein glue and 1½-in. brass screws. A view of this is shown in elevation.

The frame of ¾-in. spruce can now be marked out from half-detail drawings. Frames 2 and 3 are cut out in the center and although not essential, frame 3 is reinforced with ¼-in. plywood on both sides. This makes a much stronger craft. All frames are notched to receive battens, details of notching being shown at frame 2 and 3. If a number of kayaks are being built, a set of master patterns full size made from light plywood or stiff cardboard will save the instructor considerable time in checking the accuracy of the boy in his laying out. Remove the spreaders at position of frame 3 and insert the frame itself. Mark out position of frames on sheer and chine battens. The distances are measured in a straight line from bow to stern and are shown in plan drawing. All frames are fastened at sheer and chine battens the latter fitting into the notches provided in the frames.

The notches require to be beveled slightly in order to fit close to the battens. Fastening of battens to frames can either be done with 1½-in. brass screws or 7d galvanized nails and a little casein glue on each joint also helps. The keel batten also fits into the frame notches and is beveled at bow and stern to fit on top of breast hooks, likewise the other two battens on the bottom of the boat. Cockpit framing is shaped from ¾-in. spruce. Frame 2 is cut to receive the pointed end of piece 11 while it is supported on cleats fastened to frames 3 and 4. Install floor boards which are nailed to frames 2 and 3 and supported by a cleat at frame 4. Complete the filling in of deck battens which extend from bow to frame 2, and from stern to frame 4. These deck battens are beveled to fit on top of breast hooks at bow and stern. Sharp edges at sheer and chine battens, also at stems, should be removed to prevent cutting into the canvas covering. Examine all nails and screws to see that none protrude. A carelessly driven nail or screw will often wear a hole in the canvas. Screws are countersunk, of course, and where nails are used in place of screws, a little boring and countersinking will set the head of the nail beyond the point

where it can do damage to the canvas. Apply one coat of good outside paint to the completed boat frame.

Canvas Covering

In applying the canvas there are two pieces, one the 48 in. to cover bottom and sides of boat, the other to cover the deck. Although accurate specifications as to quantity of canvas are provided, it would be well to apply a good tape measure from extreme point of bow, down the bow stem, along the keel, and up the stem at stern to extreme point, there allowing 2 in. extra at each end.

Stretch the 48-in. canvas from end to end of boat over the bottom, pull up at stems and put a tack at each end. Beginning at frame 3 pull canvas in a vertical direction, and tack along the top of sheer batten first at one side of the boat and then at the other. Work from frame 3 toward the bow pulling up tight a small stretch at a time and tacking. Two boys can do this very nicely, one pulling the other tacking. Experience has shown that boys want to pull the canvas in a slanting direction. Tacks should be about 1 in. to 1½ in. apart. Canvas at bow and stern stems is cut, the joint being sealed with a little marine glue or white lead, then tacked firmly to the stems. Sponge the canvas with water to shrink. This will generally remove small wrinkles. If any wrinkles remain, loosen tacks and pull up tight. The deck canvas is now stretched on and pulled down the sides of the boat, being tacked into the sides of the sheer battens. Fastening of canvas around the cockpit is done by tacking on the edge of cockpit framing. The overlapping of the deck down the side of the sheer batten is covered with a 5/8-in. bead. This is better put on after the painting has been done. The cockpit sombing is also better put on after the painting. Some boys prefer white cotton rope instead of the 5/8-in. bead.

Painting

For a first-class job, filler and a finishing coat of satin auto oil are recommended in addition to the zinc paste. For those desiring to cut down the cost and simplify the painting, good outside lead paint may be used entirely. However, during the first coat of paint, canvas absorbs it quickly, and the filler eliminates that considerably. The use of airplane dope is not recommended.

Specifications

One coat Lesscoat (a filler which seals the pores).

Two coats zinc compound thinned with linseed oil and turpentine.

One to two coats satin auto oil clear, plus pigment ground in oil (2 to 3 lb. pigment to 1 gal.).

Suggested Color Schemes

1. Chrome green body, chrome yellow deck.
2. Chrome green body, chrome yellow and white deck.
3. Ultramarine blue body, white deck.
4. Ultramarine blue body, orange and yellow deck.
5. Black body, yellow deck.
6. Yellow body, white deck.
7. Orange body, lemon yellow deck.
8. Vermilion body, white deck.
9. Vermilion body, white and vermilion deck.
10. Chrome green body, white deck.

Bill of Material

Part No.	*No. Required*	*Material*	*Size*
1 to 5	1	S2S straight-grained spruce	¼" x 12" x 8' 9"
3	2	Oregon pine ply	¼" x 11" x 2' 2"
6 and 8	1	Straight-grained spruce	¼" x 6" x 2' 6"
7 and 9	1	Straight-grained spruce	¼" x 8" x 4'
10	11	S4S Straight-grained spruce	¾" x ¾" x 10'
11 and 12	1	S2S Straight-grained spruce	¾" x 5" x 6' 9"
13	2	S4S Straight-grained spruce	¾" x 3" x 4' 4"
14	1	S4S Straight-grained spruce	¾" x 3" x 1' 6"
15	1	S4S Straight-grained spruce	¾" x 1" x 5'
16	6	S4S Oregon pine	⅞" x 1¾" x 4'
17	1	S4S Straight-grained spruce	¾" x ¾" x 2'
18	2	Half-round redwood molding	¼" x ⅜" x 10'
19	2	Oregon pine ply	¼" x 6" x 2'
20	1	Oregon pine round pole	1¾" x 1¾" x 8'
	3½ yds.	Double-filled white duck canvas	48", 10 oz.
	3 1/3 yds.	Single-filled white duck canvas	29", 8 oz.
	7 doz.	F.h.b. brass screws, or	1½", No. 8
	1 lb.	Galvanized nails	7d
	1 lb.	Galvanized finish nails	3d
	1 lb.	Casein waterproof glue	
	12 lb.	Zinc compound	
	1 qt.	Lesscoat	
	½ gal.	Boiled linseed oil	
	½ gal.	Turpentine	
	1/16 gal.	Pigment ground in oil	
	¼ gal.	Satin auto oil clear	

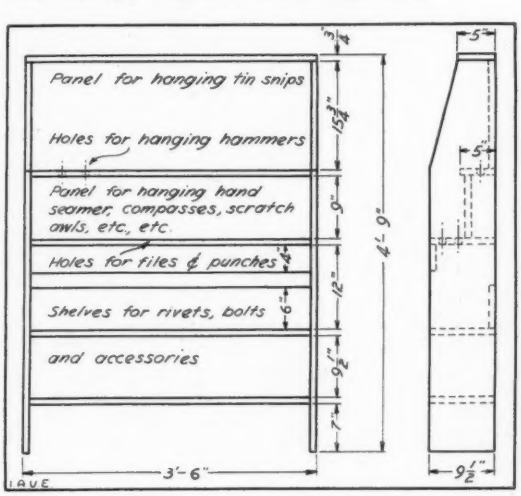
TOOL CABINET FOR SHEET METAL

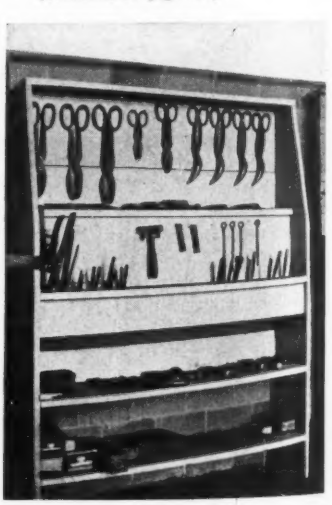
G. B. Westerberg, Junior High School, Red Lion, Pennsylvania

The storage of tools in the general shop is often quite a problem. The cabinet here described has been of considerable help in solving that problem. The advantages of this cabinet are: (1) The tools are at hand when needed; (2) a glance will reveal whether or not any of the tools are missing, or whether they are placed in a disorderly fashion; (3) the cabinet requires only a small space and accommodates a comparatively large number of tools.

The cabinet shown was made to accommodate the following pieces of equipment: Hammers — 2 ball-peen, 5 rivet, 4 setting-down; snips — 3 circle, 4 hawkbill, 2 pr. No. 6½ straight, 1 pr. No. 8 straight, 1 pr. No. 13 straight; miscellaneous tools — 2 wire gauges, 6 files, 6 solid punches (assorted sizes), 6 cold chisels (assorted sizes), 4 hand groovers (assorted sizes), 6 hollow punches, 6 prick punches, 3 rivet sets, 3 pr. dividers, 1 hand seamer, 2 hand punches, 1 pipe crimper, 1 framing square, 1 try square (steel), rivets and bolts.

Pine was used in the construction of this cabinet. The size may be varied to suit the number of tools to be stored. The cabinet illustrated has been in constant use since 1929, and is still in good condition.





Cabinet for sheet-metal tools

REMOVING WARP FROM BOARDS

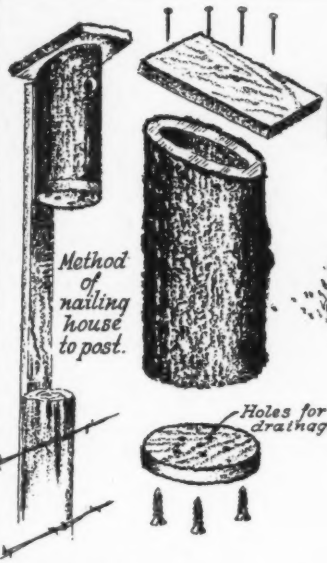
F. E. Tustison, Department of Physics and General Mechanics, The Stout Institute, Menomonie, Wisconsin

The shrinking and swelling of wood is due mainly to the effect of moisture. Wood is made up of individual particles called cells and these cells contract and expand according to whether they are dry or wet. When a cell dries out, it contracts or shrinks, and when it becomes damp or wet it swells or expands. It is common knowledge that at certain times of the year the wood in our homes shrinks. The drawers and doors in cabinets and boards in the floor show large cracks, whereas at other seasons they fit quite tightly. The cause of this is the moisture content of the wood. If the air is damp, the wood cells take in moisture and swell, or, if the air is dry, they lose moisture and shrink. In the winter months the air is unusually dry in our homes with the result that woods dry out, while in the summer months when the air is more humid they take on moisture.

(Continued on page 171)

HOLLOW LOG BIRD HOUSES

BY W. BEN. HUNT—HALES CORNERS, WIS.



Method of nailing house to post.

Holes for drainage.

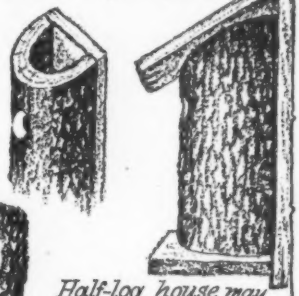
Slant roof house. If bottoms are fastened with screws, they may be opened easily for cleaning.

Hollow logs & branches are found wherever there are old trees. Almost any log of 6 inches or over will make some kind of a bird house. Use an inside-bevel gouge to cut away all rotted parts from inside of log.

Log before and after cutting away rotted parts.

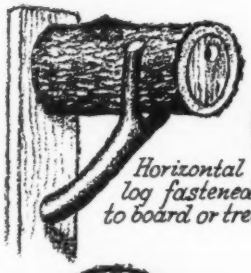
Gable roof

When a log is rotted thru, cut away the bad side and use the good part.



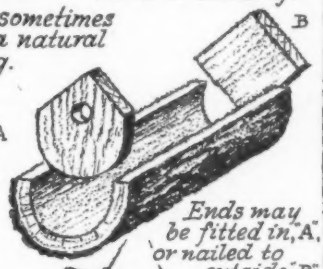
Half-log house may be fastened to a board or building.

A knot sometimes forms a natural opening.



Horizontal log fastened to board or tree.

Half of log can be used as a roof.



Ends may be fitted in, A, or nailed to outside, B.

Canopies can be left on ends of logs.

Be sure to bore a few holes near the top for ventilation, and also a few at the bottom for drainage.

Use old weathered boards for roofs, ends and floors.

A bent limb may work out in this manner.

A two-story wren house

Bore hole for lower nest on other side.

Do not hang wren houses where the wind will slam them against anything.

Cut a slot halfway thru and as wide as board is thick.

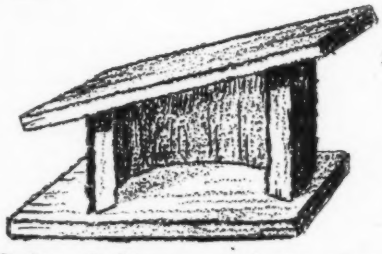
Shape the board to fit the log.

Whereas birds are never seen with micrometers or even tape lines, still they are rather fussy about the size of the interior and the opening and the height of the house from the ground. A few of the common bird house sizes are listed here.

KIND OF BIRD	FLOOR	DEPTH	HOLE	HEIGHT
Titmouse	4"x4"	8"	1¼"	5 – 12 FT.
Wren	4"x4"	6"-8"	⅞"	6 – 10 FT.
Nuthatch	4"x4"	9"	1¼"	12 – 15 FT.
Bluebird	5"x5"	8"	1½"	5 – 10 FT.
Tree Swallow	5"x5"	6"	1½"	10 – 15 FT.
Martin	6"x6"	6"	2½"	16 – 20 FT.
Woodpecker	6"x6"	12"-15"	1½"	12 – 20 FT.
Flicker	6"x6"	12"-15"	1½"	8 – 10 FT.
Screech Owl	8"x8"	12"-15"	3"	10 – 25 FT

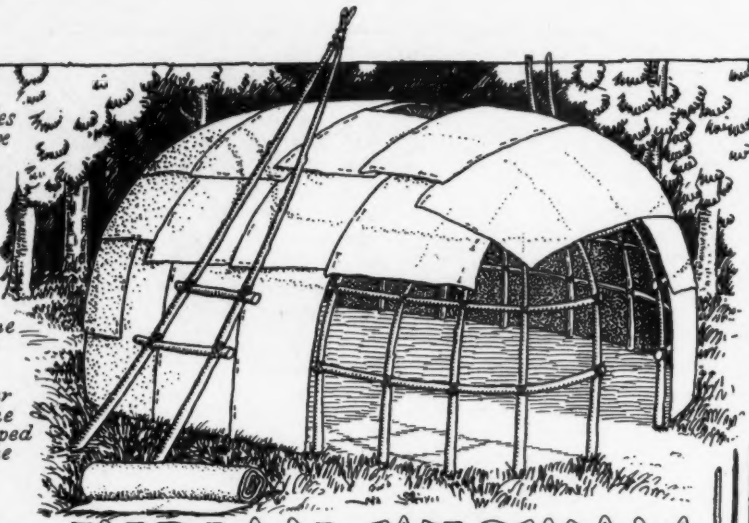
Do not put perches on houses for wrens, bluebirds, nuthatches, woodpeckers or flickers and do not place them where they can be easily reached by cats or small children.

Birds like to be left alone at all times.



Robin shelters and feeding boxes can be easily built of hollow logs measuring about 10 inches or more in diameter.

Strive for originality in the design of these bird houses.



INDIAN WIGWAM

PLATE BY W. BEN. HUNT – HALES CORNERS, WIS.

Indians in the North Central States still make this type of wigwam for summer use and for camping. These wigwams may be covered with birch bark or rush mats but in most cases canvas is used. The top or roof is always of some material that is water proof.

When the summer season is over, the covering is stripped off and the frame is left standing until the next summer. Then with a few minor repairs and a little tightening up it is ready for another season.

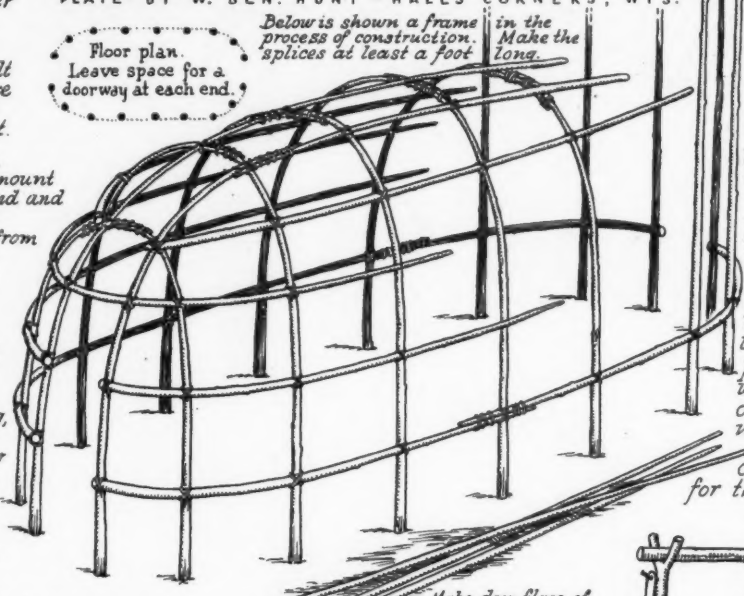
Sometimes these wigwams are built round but they are usually built as shown at the right.

The size, of course, depends on the amount of material on hand and the number of boys. 7'x9' to 8'x12' and from 6' to 7' high is a nice size for boys to build.

The mitä'wi'hiŏps or medicine lodges of the Menomini Indians of 50 years ago were 60' to 70' long, 20' wide and about 8' high at the center top. They were built in the same manner as the wigwam but the upright poles were about 3" thick at the butt ends.

Floor plan. Leave space for a doorway at each end.

Below is shown a frame in the process of construction. Make the splices at least a foot long.



If the bark is removed from the poles the frame work will look neater and will last longer.

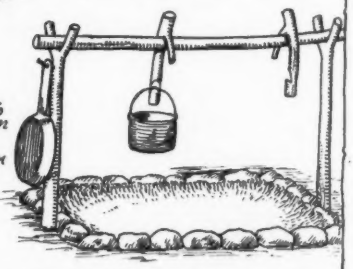
Green saplings of any kind may be used. They should be about 10' to 12' long and not too thick. About 1½" at the butt end is a good size

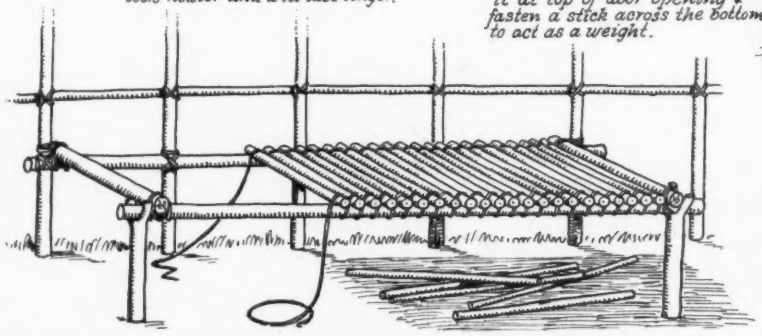
Lay out the shape on the ground and set the butt ends about a foot in the ground. Space them about 1½ to 2 feet apart. The ends are then bent down toward the center and bound with whatever you have on hand, thin rope, heavy cord or as the modern Indian does today, with bale wire. Years ago they used strips of inner basswood bark.

The cross poles may be somewhat thinner, about 1" at the butt. Always fasten the butt end of a pole first and then bend and work toward the smaller end.

The upper sketch shows how the wigwam is covered with small pieces and strips of canvas or other material. It may be pinned together with large thorns or with 6 penny nails. Leave an opening in the center of the roof for the smoke hole.

Make door flaps of canvas for bad weather, or of mosquito netting. Fasten it at top of door opening & fasten a stick across the bottom to act as a weight.





Bunks like this should be built along each side of the wigwam, to serve as beds, places to sit, and for storage space. A layer of pine boughs or hay should be laid over the sticks first and blankets or burlap thrown over that. Use 2" poles for the frame and ½" to ¾" sticks for the cross pieces. Tie them as shown. Do not try to nail them as the frame poles will split and the entire top of the bunk will be loose.

Build the fireplace in the middle of the wigwam by setting stones halfway into the ground in a rectangle measuring about 18"x24". Then pack clay around the inside, against the stones, making a sort of pan-shaped affair.

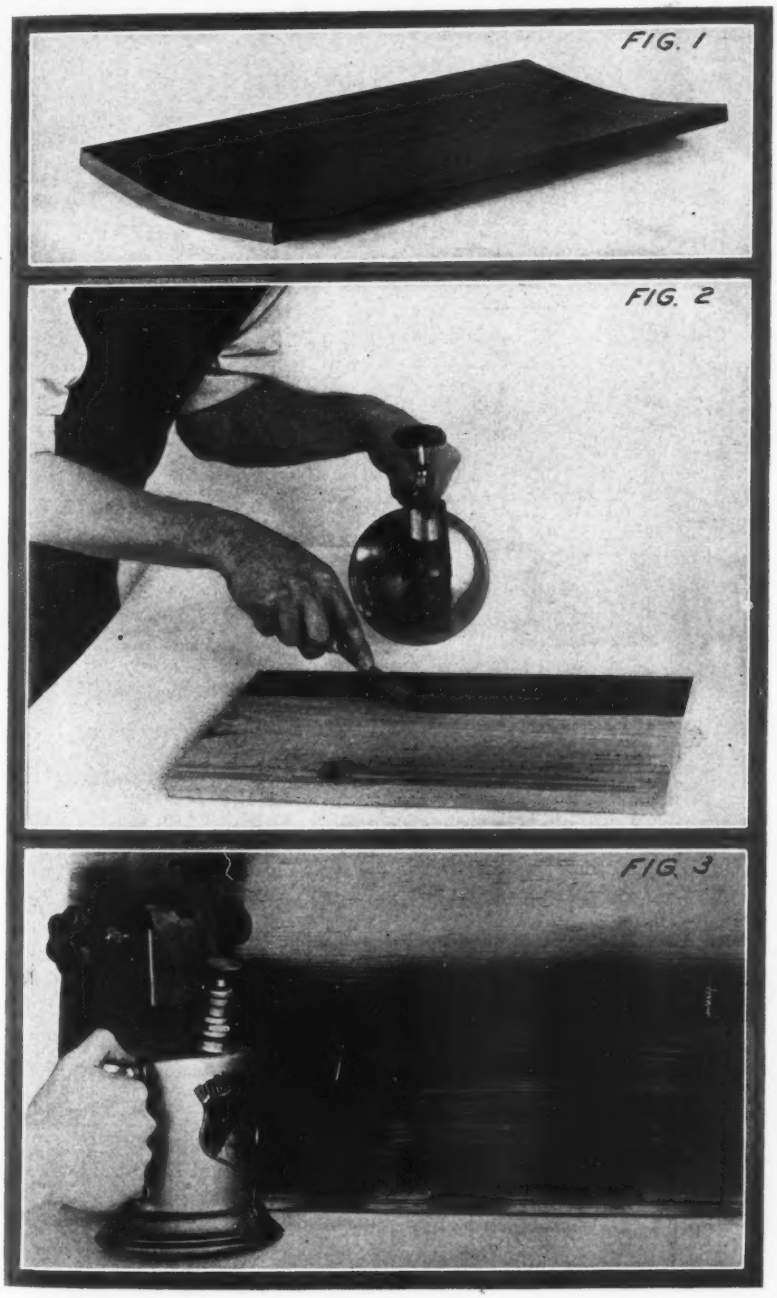
In bad weather, the fireplace is used for cooking and in the summer time it is used for mosquito smudges. The stones around the fireplace will tend to keep the ashes where they rightly belong.

REMOVING WARP

(Continued from page 168)

The warping of boards is often due to moisture, since unequal expansion and contraction is one of its results. Figure 1 shows an example of a badly warped board. A board that expands more on one side than on the other, warps, and if it contracts more on one side than on the other, it also warps, but in the opposite direction. Boards lying on the ground usually cup upward because the side next to the soil is dampened and gets wider than the upper side. On the other hand, a board on top of a lumber pile often cups upward not because the under side becomes damp, but because the upper side usually dries faster.

A knowledge of this effect of moisture on wood is important to the woodworker. If we can control the moisture content in the air or in the wood, we can eliminate some of the troubles due to shrinking, swelling, and warping. Often boards which are in the home become warped after a time. This is most inconvenient, especially in table tops. If the situation is analyzed, it is found that the row of cells in the "bowed" side of the board are larger than those in the cupped side. Wetting the cupped side would tend to straighten out the board but just as soon as the moisture evaporated, the warp would return. Another plan is to drive some of the moisture from the cells of the bowed side. If the moisture could be kept from returning to the dried cells, the board would then remain straight. If a very hot flame is used to drive out the moisture, it will not readily return. This necessitates very severe treatment of the board, but it accomplishes results. The author has successfully removed warp from table tops again and again. A board warped by the unequal tension of the rings and medulary rays may not respond to this treatment.



A common quart-size blowtorch will be found very convenient. Hold the board in a suitable position so that the flame may be applied to the bowed (convex) side. The board may be horizontal or perpendicular, but the flame is more easily applied when the board is standing upright.

If there is a finish on the board, it should be removed. This can be done with the torch and a putty knife, or with paint-and-varnish remover. To remove the finish with a torch, melt it with the flame and scrape it off with a putty knife, as shown in Figure 2.

If the board or top has been glued up of two or more pieces, do not allow the flame to touch the glue joints for any length of time. Heat applied to a glued joint may cause it to open.

Apply the flame of the torch directly to the bowed side of the board as shown in Figure 3. Move the flame quite rapidly at first so that the whole surface is warmed uniformly. Figure out a system of flame movement so that the whole board will be heated at all parts of the surface. As you heat the surface, it will be necessary to watch the decrease in the warp of the board. It is imperative that the board is not heated until it is entirely flat, because it may then cup in the opposite direction while cooling. A good rule is to bring it about two-thirds of the way back to flatness; then, as it cools, the contraction will bring it back the other third. *Remember to keep the heat off the glued joints.*

The question always comes to the mind of the beginner: will not the heat ruin the board, or how long can the flame be held at one spot? As indicated before, to make the board straight requires severe treatment. A good rule to follow is: Hold the flame only momentarily at any spot, or better still, keep the flame moving constantly. In many cases it will be necessary to char (when the wood begins to turn brown) the wood slightly before the heat produces the desired effect. When about two-thirds of the warp has been removed, stop and allow the board to cool. If then the warp has not entirely been removed, heat the board and try again. If too much warp has been removed, heat the opposite side. If after considerable heating the warp fails to remove it will be best to stop this treatment. Warp due to reasons other than moisture cannot be removed by this procedure.

The author has in mind several warped table tops of prized curly black walnut which he treated. These tops had not been thoroughly seasoned and had warped considerably. They also had a natural finish to show up the curly figure. The flame was applied directly to the exposed surface until the warp was removed, then, after sanding and refinishing, it was found that the beauty of the grain was as pronounced as before.

The amateur craftsman will find this method of removing warp very interesting. It may be well to practice on a scrap piece of warped stock before attempting to

straighten out the wood in a very particular job.

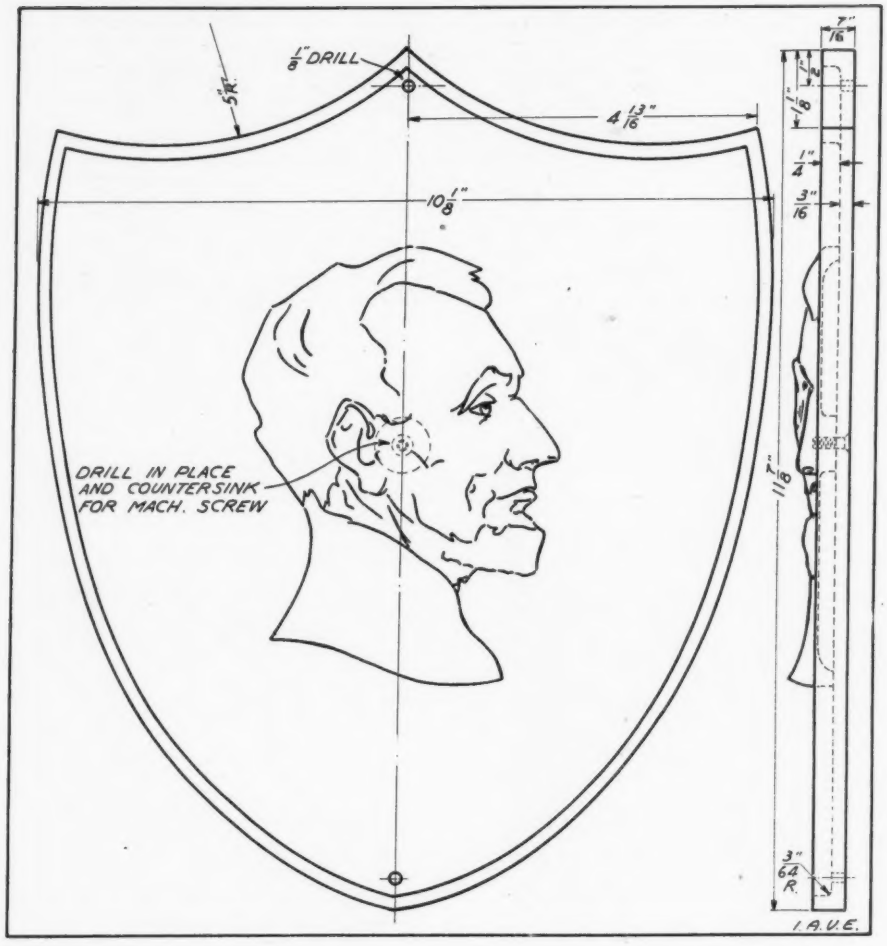
After such treatment, the surface of a board, if it is to be exposed, must be refinished. To do this, remove just enough of the scorched wood to remove the discolored area. If the surface is to be painted rather than given a natural finish, the discolored portions need not be removed. However, in both cases the surface should be sanded smooth. When a natural finish is to be applied, more sanding, of course, will be necessary.

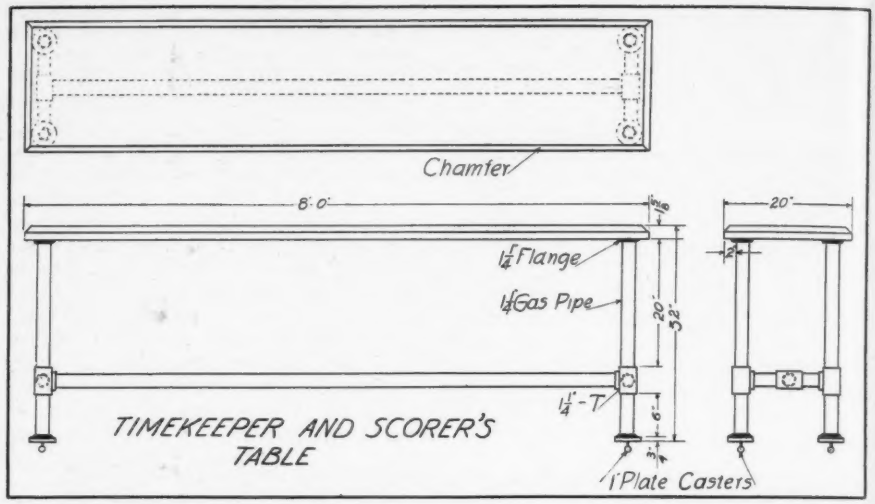
LINCOLN-HEAD SHIELD

C. H. Niemann, Hammond, Indiana

The making of this shield involves a job in patternmaking and some machine-shop work. A wood pattern is first made of the shield and from this an aluminum casting. The head is a separate casting and is fastened to the shield with an f.h. machine screw. A boss is provided in the head, into which a hole is drilled and tapped for this screw.

The whole casting is then filed smooth and finished with fine emery cloth, making a permanent metal pattern. The castings made from this pattern should also be given a file finish and then can be bronzed or enameled to suit. An effective finish is obtained by painting the shield with aluminum paint and the head with a deep gold bronze.





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R. L. Ready, Public Schools, Batavia, Illinois

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The top is made of 2-in. clear fir, 2 by 12 in. and 2 by 10 in. Care should be taken in making the joint. The dowels should be of ¾-in. dia. and spaced every 10 in. The material for the top should be well seasoned and dry.

The top is fastened on with four ¼ by 2-in. carriage bolts in each leg.

Personal News

M. R. BASS APPOINTED DIRECTOR

Mr. M. R. Bass, who was recently appointed director of the David Ranken School of Mechanical Trades in St. Louis, Mo., was formerly assistant director in charge of evening, extension, and part-time instruction in the William Hood

M. R. BASS

Dunwoody Industrial Institute, in Minneapolis, Minn.

Mr. Bass began his industrial career as an auto mechanic. At the age of 24 he became the head of the largest auto-repair garage in Minneapolis. With the establishment of the Dunwoody School,

(Continued on page 10A)

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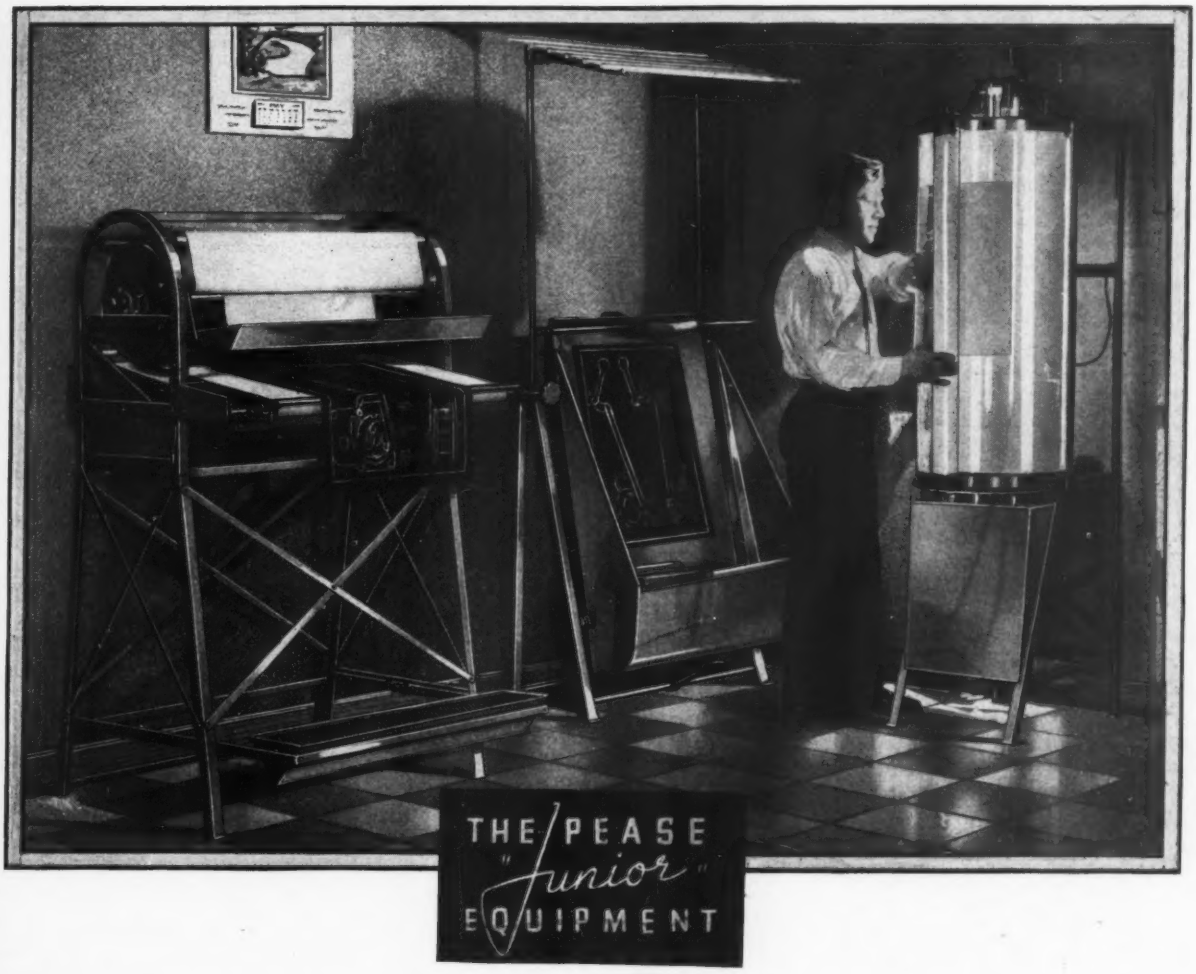

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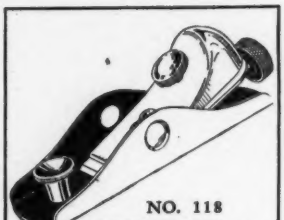

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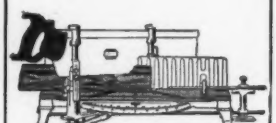

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STANLEY TOOLS
Educational Department
NEW BRITAIN, CONN.

(Continued from page 172)

Mr. Bass was appointed head of the auto department. He served there for many years, becoming in time director of the evening extension, part-time education, and placement service.

He holds a B.S. degree from the Colorado State College in Fort Collins and is a member of the summer-school faculty of the Colorado College. He is the author of books and pamphlets on adult and vocational education and was responsible for the preparation of the manual for CCC instructors on conservation of natural resources.

¶ Dr. Verne C. Fryklund, a member of the faculty of the University of Minnesota, has been appointed Supervisor of Industrial Education and Associate Professor at Wayne University, Detroit, Mich. Dr. Fryklund has been assistant professor of industrial education at the University of Minnesota since 1930. He is a graduate of Stout Institute and the Colorado State Teachers' College, and received his Ph.D. degree from the University of Minnesota in 1933. He has an extensive experience in teaching and is the author of a number of books and articles on industrial-arts subjects.

¶ Dr. Cyril F. Klinefelter has been appointed administrative assistant to the United States Commissioner of Education. This is a new position, created by the action of the last Congress. Dr. Klinefelter received his A.B degree from Ohio State University. He holds a teacher's diploma in secondary education from Teachers College, University of Cincinnati, a B.Sc. in Education from Ohio State University, and an Sc.D. in Education from the College of Puget Sound. He was an assistant supervisor of trade education for one year in Ohio, and in 1920 became a member of the staff of the trade and industrial education service of the Federal Board for Vocational Education. He continued in this position until August, 1935, when he assumed the position of editor and educational consultant, which he held up to the time of his present appointment.

¶ Mr. Ralph Fanning and Mr. Alfred G. Pelikan will be in attendance at the eighth International Art Congress, to be held in Paris in 1937. They will also attend the Western Arts Association in Toledo, April 14 to 17, where they hope to meet others who intend to go to Paris for the Art Congress.

¶ Mr. Thomas A. Hippaka, of Madison, Wis., has been elected president of the Southern Wisconsin Education Association. Mr. Hippaka is supervisor of manual arts in the Madison high schools.

¶ Mr. Warren Seeley, formerly local director of vocational education at Chattanooga, Tenn., has been appointed state supervisor of trade and industrial education at Nashville. He succeeds Mr. A. S. Zoerb, who has been placed in charge of an in-service training program for the employees of the Eastman Kodak Company.

Association News

THE 11TH A. V. A. CONVENTION AT SAN ANTONIO

(Continued from page 12A, February issue)

On Thursday afternoon, the industrial-arts-education meeting, under the chairmanship of Dr. Louis V. Newkirk, Director of Industrial Arts, Chicago, Ill., was given over to the study of the problems confronting industrial arts. At this meeting, the need of a revision of the standards of attainment in industrial-arts teaching was discussed, and it was decided that such a revision be started at once. The committee on tests and measurements also made its report, which contained an outline of the book which this committee is about to publish on the subject of testing.

In the 10-minute discussions which were presented after the committee reports, O. B. Badger, Director Industrial and Adult Education, Tulsa Public Schools, Tulsa, Okla., emphasized the needs of setting up objectives and of testing them. He also suggested that the analyses made by the committee on standards of attainment be extended to take in the fifth and sixth grades. Charles F. Bauder, Director Division of Industrial Arts, Philadelphia, Pa., spoke on "Work to be Given to the Less Able Boys in Diversified Shops," describing just how this may be done. J. G. Grove, Professor Industrial Education, East Texas State Teachers College, Commerce, Tex., pointed out the need of simplification of nomenclature used in industrial-arts work.

Howard A. Campion, Assistant Superintendent in charge of Adult and Vocational Education, Los Angeles, Calif., read the paper which should have been presented by C. E. Nihart, Supervisor of Vocational and Practical Arts, Los Angeles, Calif. His subject was "What Will Happen to the Industrial Arts in a Progressive Education Program. Will There be a Fusion, Integrating, or an Activity Program?" He pointed out how the shop must be made flexible enough to present opportunities to all school children at all times.

J. E. Park, Director Industrial Arts Teachers Education, State Normal School, Oswego, N. Y., spoke on "The Selection and Training of Industrial-Arts Teachers," and Dean M. Schweickhard, Assistant Superintendent, Minneapolis, Minn., discussed the question of "How to Keep Industrial-Arts Courses Abreast of Industrial Progress."

At the combined industrial-arts and industrial-education sessions Friday afternoon, the chairman was Paul L. Cressman, Director Bureau of

(Continued on page 13A)

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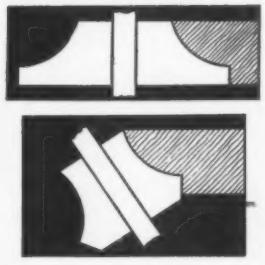

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THE STANLEY WORKS
New Britain, Conn.

(Continued from page 10A)

Instruction, Harrisburg, Pa. Here the Future Craftsmen of America program was discussed. Edwin E. Gunn, Jr., State Supervisor of Trade and Industrial Education, Madison, Wis., presented the problem, after which there was a panel discussion led by Irvin S. Noall, State Director of Vocational Education, Salt Lake City, Utah. Dr. Newkirk was appointed as representative of the Future Craftsmen on the executive committee of the American Vocational Association.

The Saturday-morning session was under the chairmanship of DeWitt Hunt, State Agricultural and Mechanical College, Stillwater, Okla. R. A. Hinderman, Board of Education, Denver, Colo., spoke on "Industrial-Arts Adjustment Possibilities and Vocational Education." He pointed out that man, to be successful, must possess versatility and adaptability, and that emotional control is more necessary than the control of motions. A. B. Mays, Professor Industrial Education, University of Illinois, Urbana, Ill., spoke on "Neglected Values in Industrial Education." He showed that the basic aim of industrial-arts work must always be the student taking the work. Shop teachers too often forget that, first, industrial-arts work must develop thinking habits, and attitudes; second, it must develop ideas of planning and design; third, the moral values can easily be made part of the shopwork which they teach. Harry E. Wood, Director Industrial Arts and Vocational Education, Indianapolis, Ind., gaves a very interesting and enlightening talk on "Craftwork in the Senior High School."

At the industrial-arts luncheon on Saturday, under the chairmanship of Victor Randel, Professor Industrial Arts Education. Sam Houston State Teachers College, Huntsville, Tex., Dean M. Schweickhard, Assistant Superintendent of Schools, Minneapolis, Minn., discussed the "Implications for Industrial Arts Involved in the New Federal Legislation for Vocational Education." At this meeting also, J. G. Grove spoke on "The Work of the Texas Planning Committee for Industrial Arts."

Besides the foregoing industrial-arts and industrial-education meetings, teachers and administrators interested in argicultural, commercial, home-economics, guidance, rehabilitation, part-time work, the National Youth Administration, and in the Works Progress Administration, had numerous sessions at which weighty and pertinent questions were discussed.

At the business meeting, the following new officers for the coming year were elected: President, A. K. Getman, State Department of Education, Albany, N. Y.; vice-president, agricultural education, G. B. Matthew, State Director of Vocational Education, Little Rock, Ark.; vice-president, part-time schools, O. D. Adams, State Director Vocational Education, Salem. Oreg.; treasurer, Charles W. Sylvester, Director Vocational Education, Baltimore. Md.

The 1937 convention will be held at Baltimore, Md.

NEW JERSEY INDUSTRIAL-ARTS TEACHERS MEET

An interesting and instructive meeting of the Union County Vocational and Arts Association was held on March 1, in the Abraham Clark High School, in Roselle, N. J.

Mr. Henry White of the Public Service Electric and Gas Company, who addressed the meeting, took for his subject, "Light," in which he discussed a number of points of interest to shop and drafting teachers, particularly the state school code governing natural light for schoolrooms. He criticized unusual schemes for schoolroom lighting, because of the lack of application to scientific requirements. Chief among these are improper mounting heights, insufficient outlets, and the use of glassware and fixtures of a doubtful character. He pointed out that the application of proper lighting in home, factory, and school has for years been handicapped by a lack of knowledge of what constitutes noninjurious illumination. The modern trend toward hidden or inconspicuous lighting sources was commended by Mr. White as good for proper illumination and approved by the interior decorator.—*Paul C. Hoopes*

MATHEMATICS TEACHERS HOLD MEETING IN CHICAGO

The National Council of Teachers of Mathematics held their annual meeting February 19 to 20, in Chicago, Ill. It was the largest meeting ever held, with an attendance of 836 registered teachers and a total attendance of more than 1,000 persons. At the annual banquet, Dr. Herbert E. Slaught, honorary president was given special recognition in honor of his 75th birthday. Prof. Charles E. Hutchinson read an address, prepared by Prof. H. E. Buchanan on "A New Deal from Old Cards."

MICHIGAN ASSOCIATION HONORS PRESIDENT HALL

Hamtramck was host to 400 industrial-education association men in the Detroit area, who honored President Luther Hall of the Michigan Industrial-Education Association. The third annual president's dinner served as a preconvention rally for the state convention, to be held this year on April 23, in Grand Rapids. At the March meeting, President Hall spoke on the subject, "The New Emphasis in Industrial Arts."

(Continued on page 14A)

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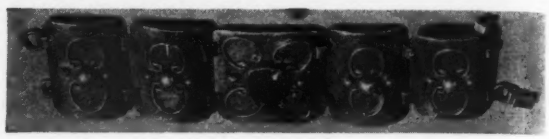

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(Continued from page 13A)

TRI-CITY TEACHERS' INSTITUTE MEETS

The tri-city institute of the industrial-education teachers was held in Hamtramck, Mich., on March 12. Teachers from Highland Park, Grosse Pointe, and Hamtramck were in attendance. A vocational section meeting was held, with a round-table discussion on the subject, "How Can the Secondary Schools Be of More Service to the Student and to Industry."

ST. CHARLES INDUSTRIAL-EDUCATION SOCIETY

Round Table No. 2 of the St. Charles Industrial-Education Society was held on March 5, at the St. Charles School for Boys, St. Charles, Ill. More than one hundred men were in attendance.

Following the supper in the school cafeteria, there was a tour of the cottages, shops, and culinary departments. The general meeting opened at 8 o'clock in the vocational department, and was in charge of Mr. Carl C. Cramer, president of the society. Mr. A. J. Tauen gave the "Greeting." He was followed by Mr. R. A. Cooney, who talked on "The Romance of St. Charles Boys' School"; Mr. E. A. Miller discussed "Raw Material and How to Develop It"; Mr. Donald Strickler talked on "Business Training"; and Mr. C. T. Allen took for his subject, "Molding in the General Metal Shop."

WISCONSIN TEACHERS VOTE DELAY

The Southern Wisconsin Educational Association, at its recent meeting in Madison, voted to delay action on a resolution proposing to place the University and other educational institutions under an elected state board of education. The members adopted a resolution, proposing that Mr. Thomas A. Hippaka, of Madison, appoint a committee of five to study the matter and report on it at the next annual meeting.

EPSILON PI TAU INSTALLATION CEREMONY

Epsilon Pi Tau, the national honorary professional fraternity in industrial arts and vocational education, held the installation of Omicron Chapter in the State Teachers' College at Newark, N. J. The initiation was arranged by Gerald Gordon Pugh, and the banquet was in charge of Gilbert G. Weaver, of the New York State Department of Education. The Laureate Panel Program was led by Charles F. Bauder, and the principal address was given by John Woodman Higgins, honorary member, who spoke on "Vocations, Skills, and Brains." The charter presentation was made by William E. Warner and the presentation of keys was made by John J. Hatch, of the State Teachers' College, Newark. A total of 41 were installed at the ceremony.

Charter Members Omicron Chapter, Epsilon Pi Tau, State Teachers College, Newark, New Jersey.

1st row, left to right: Richard S. Cole, Wilbur D. Snyder, James DeWalsche, John J. Buchanan, E. Lloyd Kingsley, Ellis J. Walling, Donald S. Lacey, William M. Ashley, John C. Stormer, Fred M. Richmond. — 2nd row: Joseph Patrick, Arthur von der Linden, Walter Kabis, Earl W. Butler, Leonard Johnson, Frederic Weiskoff, George W. Lachner, John W. Seeley, Charles M. Jochem, Roy F. Pollino. — 3rd row: Albert Rothbard, Herbert Hartley, Leon L. Brazer, Allen W. Roberts, Oscar Ebner, Frank X. Birkner, Lawrence M. Davie, Cornelius Flanagan, Howard Junker, Arthur S. Goldberger. — 4th row: Louis V. Clew, Patrick Marchesan, Daniel Verniero, Michael Homack, Charles H. Detgen, Frederick M. Lavenburg, Albert Bradbury, George Lush, Leon R. Kvedar, James B. Wiebe, George Stryker.

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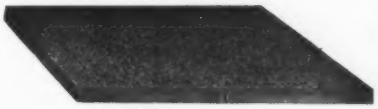

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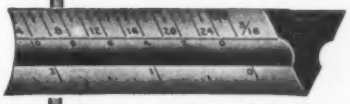

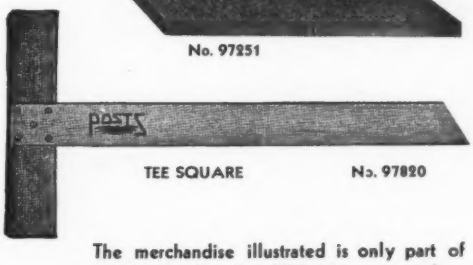

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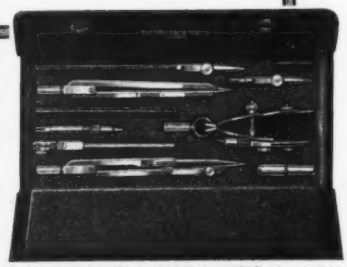

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School-Shop Equipment News

ATLAS ANNOUNCES LATHE MANUAL

The Atlas Press Company, 1819 North Pitcher St., Kalamazoo, Mich., has announced a new lathe book entitled, "Manual of Lathe Operation," which is intended as a permanent reference manual for all shopmen. The book which

contains 272 pages, describes and illustrates the latest technical information for machining metals and plastics.

The contents and makeup of the Manual indicate careful planning, extensive study, and research. Among the subjects covered are lathe care and operation, machining of various metals, drilling and boring, thread cutting, lathe attachments and their use, woodturning on the metal lathe, and the use of cutting tools. Several pages are devoted to useful shop notes. The booklet is sold at the small price of $1.

DEMONSTRATING THE OLIVER SPINNING LATHE

One of the interesting attractions at the recent convention of the New Jersey Vocational Association in Asbury Park, was the demonstration of spinning, on a No. 159 Oliver spinning lathe. The demonstration attracted a great deal of attention and there was hardly a time that the booth was not surrounded with instructors watching the operation.

The machine was set up and the demonstration arranged by Mr. Arthur Blake, eastern manager of the Oliver Machinery Company, and the actual demonstration was carried out by Mr. Elkington, an instructor in the Point Pleasant, N. J., High School. Mr. Elkington did an exceptionally good piece of work, spinning ash trays, bonbon trays, and other forms of pewter and copper work. Opportunity was also given to other instructors to try the lathe.

PORTER-CABLE HIGH-POWERED DISK EDGER

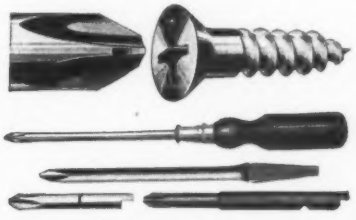
The Porter-Cable Machine Co., Syracuse, N. Y., has just announced its new E-17 disk edger, a disk type of machine with dust pick-up

system, for sanding floor edges, stairs, and other small areas.

The new Porter-Cable disk edger in operation speeds up finishing and refinishing of floors and saves tedious hand labor. Constant speed is assured under all conditions with the use of a specially wound, heavy-duty 1½ h. p. Universal motor. It is equipped with a specially designed dust intake, a floodlight which may be turned on or off, a hardened steel guard for use against baseboards, etc., helical angle gears for quietness and efficiency in use, a motor-cooling feature, and a dust bag with zipper opening. The polished aluminum frame is provided with easy-grip handles.

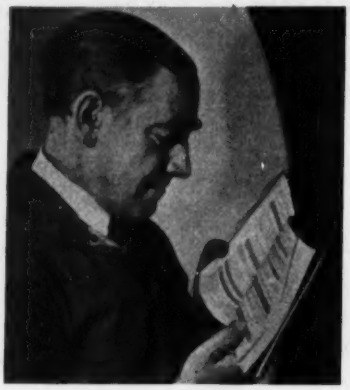
STANLEY SCREW DRIVERS FOR PHILLIPS SCREWS

Stanley Tools, New Britain, Conn., has announced a new line of screw drivers and hand-power bits for use with Phillips recessed screws. These screws are used on truck and bus bodies,



furniture, and other assembled articles too numerous to mention. Mechanics everywhere are demanding screw drivers which can be used on Phillips screws and bolts.

These screw drivers are for general use and heavy duty and are made in four sizes. Complete information may be obtained by any school-shop instructor upon request.



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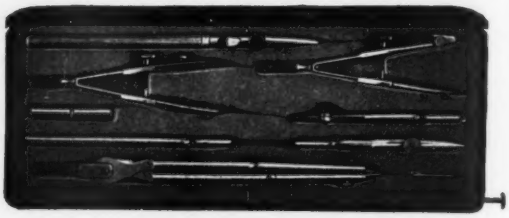

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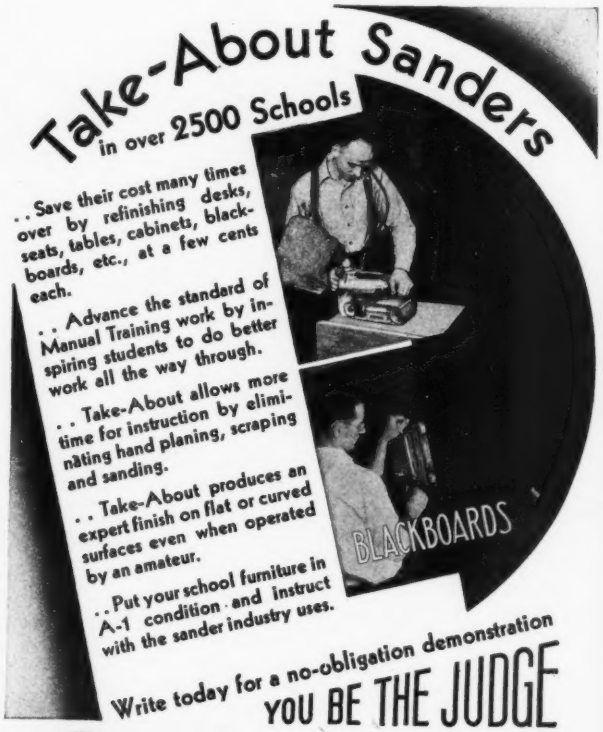
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